Xsp - 220 DT

Operator Manual

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1 Introduction

1.1 Basic Overview of the Xsp-220 DT

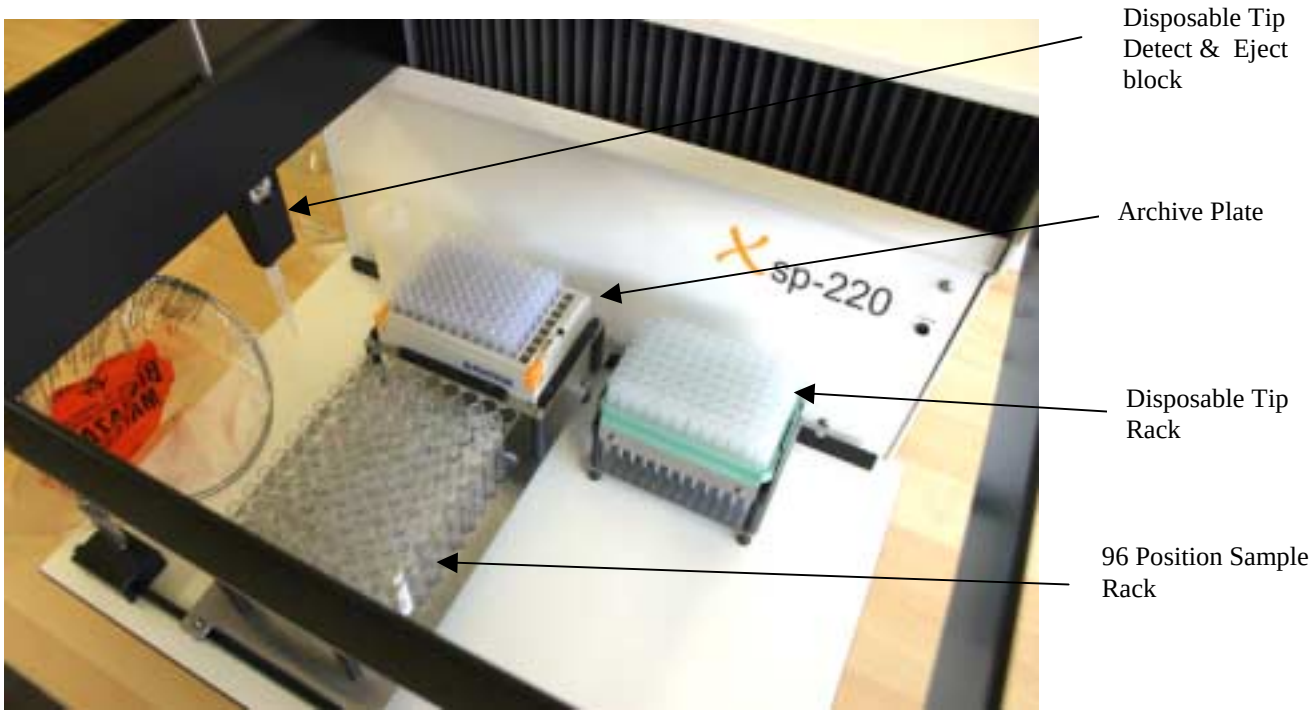


Figure 1

The XSP–220 DT sample processor comprises an "XYZ" platform fitted with a single Z drive and an integrated syringe drive connected to a probe fitted with a disposable tip (DT) option. The DT option comprises a special block mounted under the arm that incorporates a Tip Detector and a Tip Ejector block. The Tip Detector is used to confirm that tips are picked up and ejected correctly during processing.

Pipetting is achieved by means of a special probe that picks up disposable tips via a Tip Adaptor that screws onto the end. The probe is connected to the syringe by means of the Pipetting Tubing. In operation the pipetting tubing may be filled with air or distilled water depending on whether the instrument is used in Dry or Wet mode. In either mode, it is the movement of the syringe piston that causes liquid movement in the disposable tip.

Liquid level detection is achieved by means of a special pressure sensor mounted at the back of the instrument. The pressure changes that occur when a tip moves into liquid are monitored by this sensor. It is connected to the Tip Adaptor by a second length of tubing (of smaller diameter) that is integrated within the probe called the Probe Sensor Tubing.

The sensitivity of liquid level detection is enhanced by a slow downward movement of the piston during the "Search for Liquid " move.

1.2 About this manual

This manual provides details of how to install and operate the Xsp-220. It also includes an overview of how to create the programs (called protocols) which run the Xsp-220. However, more detailed information is provided within the applications software itself in the form of on-line help windows.

1.3 Summary of steps involved in setting-up and using the instrument

The following is an overview of the steps involved in setting up and using the instrument.

1. Unpacking
2. Installing probe, racks, tubing etc
3. Check that instrument and arm are level and adjust if necessary
4. Install Software onto PC (VisProg2, Applications, Configuration disk)
5. Defining Area files
6. Creating an Application
7. Running the Xsp-220

Your supplier will probably have already performed the majority of the set-up procedures so the initial sections may not be relevant to you other than as a reference.

In addition to sections on the above this manual also includes additional reference sections on maintenance, fault finding and information on spare parts. For full servicing information please refer to the separate Service Manual especially if adjustments are required.

2 Glossary

The following is a list of some of the terms used within this manual, which are specific to the Xsp-220 and its software.

Area Definition	The process of defining XYZ co-ordinates for any item located within the Working Area of the instrument
Application Software	This is a flexible program written specifically for a laboratory application.
Area File	A file containing XYZ co-ordinates and other data "describing" an item such as a rack on the instrument so that the Probe can be go to specific positions within that rack
DT Probe	An assembly comprising a pipetting needle a pressure sensor tube, a tip adaptor, spring and locking nut
Level Sensor	An electronic circuit which detects liquid when the probe needles are immersed in conductive liquid or a change of pressure with a disposable tip
Level Sensor Plug	A connector that forms part of the probe which connects the probe needles to the level sensor circuit
Level Sensor connector	A threaded back of the instrument which connects to the level sensor tubing on the probe
Pipetting Needle	The metal needle that is connected to the Syringe Pump
Probe Guide	A black clamp which holds the Probe in position in the Z-Rack but allows some movement.
Probe Nozzle	The tapered (narrow) end of a Probe Needle which protrudes from the bottom of the tip adaptor
Protocol	A user definable file containing various parameters which control the execution of an IFA or ELISA assay.
Rack	An item or container that sits on the Working Area of the Xsp 220
System Fluid	The liquid that is primed-through the Syringe and Probe and which is used for washing the Probe. Normally distilled water
System Fluid Bottle	The glass bottle that supplies the syringe with System Fluid/wash fluid. Filled with System Fluid (PBS or Distilled water). Referred to as the Diluent Bottle in previous version of this manual.
VisProg2	The System software used for the creation and running of the IFA/ELISA Application
Waste Bottle	Glass bottle which collects the waste from the Aspirate Needle
Working Area	The area of the Tray that is accessible by the probe
Worklist	A file containing information specific for a single batch which specifies which samples in a rack are to be processed for each Test
Z-Rack	The toothed (geared) metal rod into which the Probe is inserted and which is moved up and down

3 Hardware Installation

3.1 Applied Markings

One or more of these labels may be used on your instrument for health and safety reasons. To enable their interpretation correctly each is explained.

Background colour: yellow

Symbol and outline: black

Meaning:

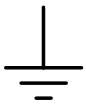
Caution (refer to accompanying documentation)

Background colour: yellow

Symbol and outline: black

Meaning:

Laser radiation - do not stare into the beam. Class 2 laser product as defined in IEC 825-1:1993. The radiation is in the wavelength range 400 to 700 nm and eye protection is normally afforded by aversion responses including the blink reflex.



Background colour: green

Symbol: black

Meaning:

Earth (ground) terminal (IEC 417, No. 5017).

Background colour: green

Symbol and outline: black

Meaning:

Protective conductor terminal (IEC 417, No. 5019).

Alternating current - the frequency (Hz), voltage (V) and current (A) or power consumption (W or VA) will be specified (IEC 417, No. 5032).

3.2 Unpacking the instrument

The instrument is shipped in a cardboard shipping case, which has been designed to minimise the possibility of damage during transit. However, when unpacking the instrument you should check that there is no obvious damage to this box or any of the contents. If there is any damage you must inform your supplier and relevant shipping agent immediately.

IMPORTANT NOTE

DO NOT LIFT THE INSTRUMENT BY THE ARM!

3.3 Packing List

A packing list (Part # 9967/700) is included with the instrument that is specific to the configuration of instrument. Please check this carefully to ensure that you have located everything within the box before throwing it away! There are some small components that may have fallen to the bottom of the containers they are shipped in.

When removing the instrument from the cardboard case do not lift the instrument by the arm. This could damage the instrument and will, at the very least, affect its alignment.

3.4 Identifying the main components of the instrument

Having carefully unpacked the instrument you will find a number of components in the accessory box. The following photographs help you identify each of the se components and where they should be located on the instrument. Installation is mostly straightforward but details of how to install the critical components such as the probe are provided below.

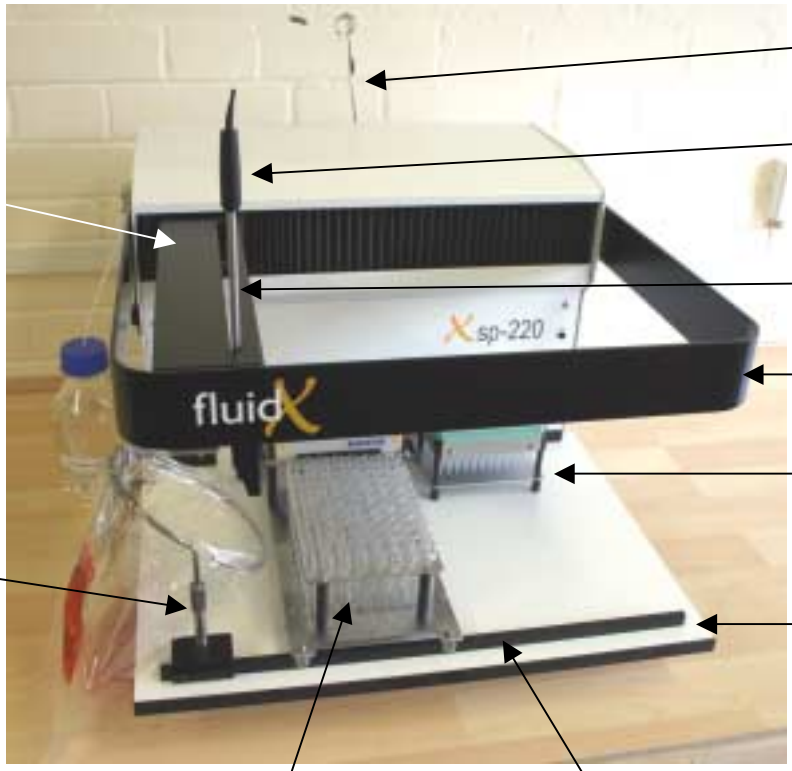


Figure 2

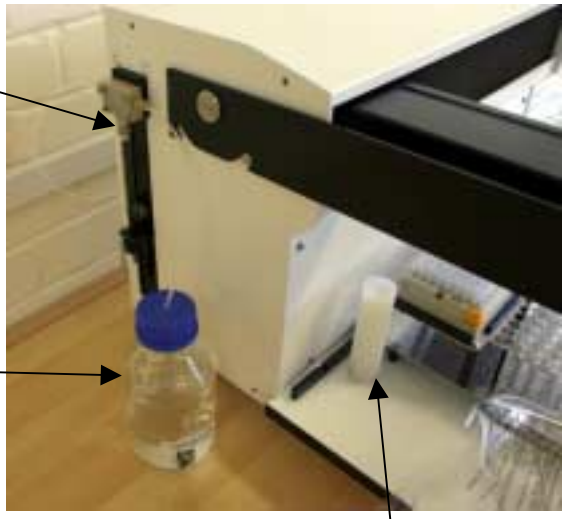


Figure 3

3.5 Levelling the instrument

3.5.1 Adjusting the feet

The Xsp 220 is built around a rigid chassis, which rests on 4 adjustable feet. It is designed to be installed on a flat bench but adjustments can be made if necessary to accommodate a small degree of unevenness.

Looking at the underside of the instrument you should see all 4 feet touching the bench and there should be no “rocking”. If there is you should adjust the feet by turning one or more feet as required. Tilting the machine back can access these. (Get someone to help you do this)

The feet on the Xsp 220 have a “click” stop to give a positive location.

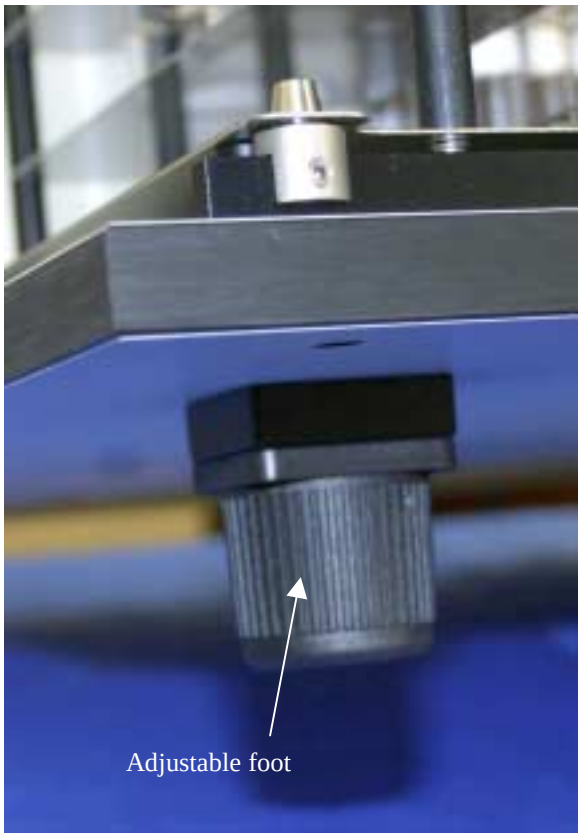


Figure 4

After levelling the instrument you should then check that the arm is level with respect to the deck. This is easier to do after the probe has been installed so this will be describer first.

3.6 Installing the probe & tubing connections

3.6.1 Installing the DT probe

The probe assembly comprises the probe, spring, locking nut and tip adaptor. The probe contains two lengths of tubing of different diameters. The smaller is used for pressure measurements and the larger is used as a fluidic connection to the syringe..

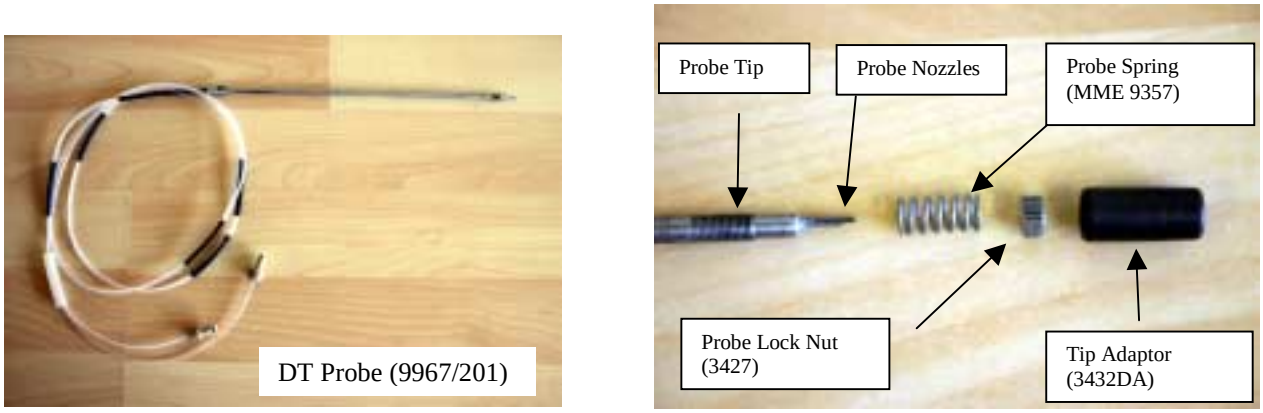


Figure 5 Disposable Tip (DT) Probe and Tip components and Tip Adaptor

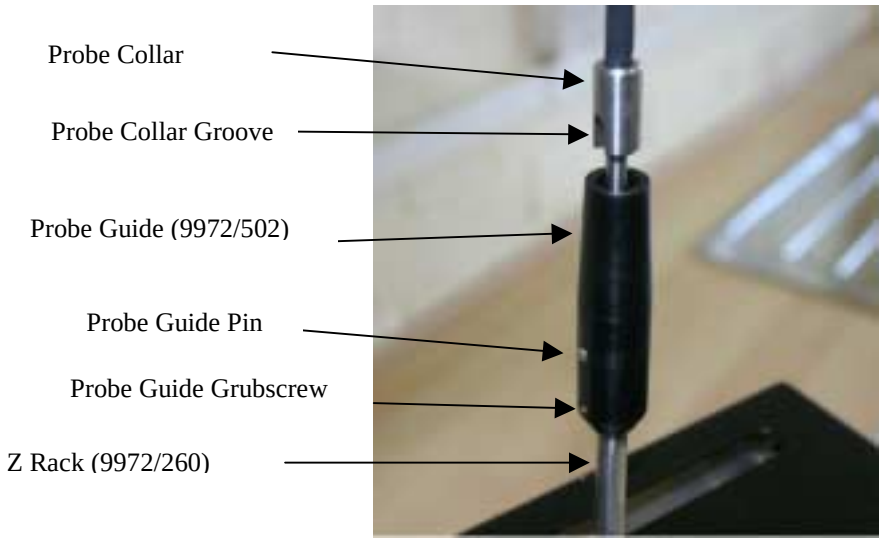
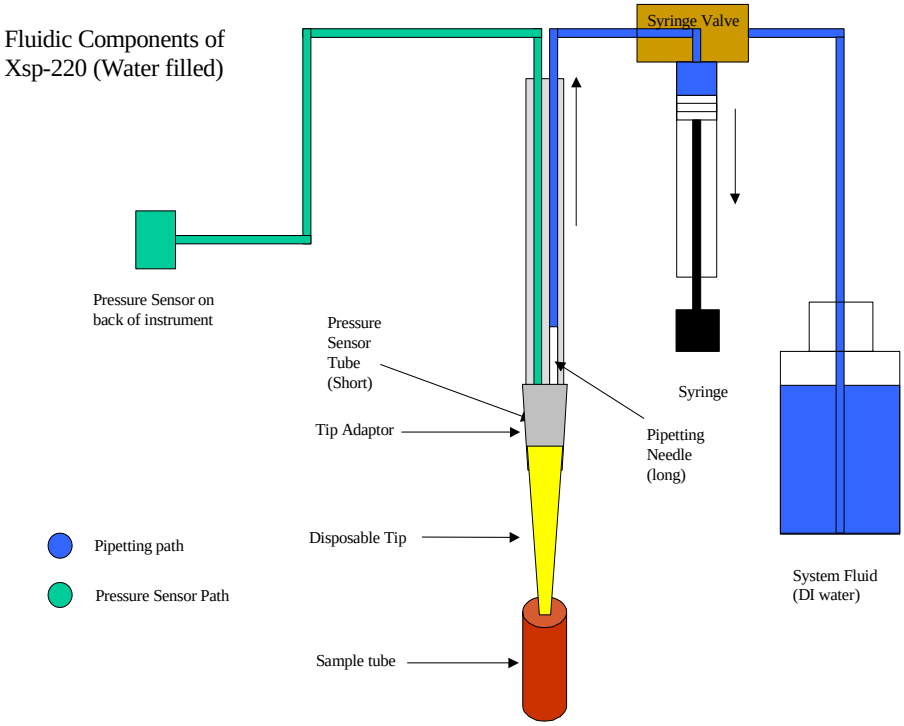


Figure 6

Install the black probe guide onto the top of the Z rack. Note that the guide pin (Figure 6) and grubscrew face towards the back of the instrument. The grubscrew should be aligned with the indentation at the top rear of the Z rack. It is located at the bottom of the probe guide – do not install upside down !
Insert the probe into the guide ensuring that the groove in the collar aligns with the guide pin at the rear.

Ensure that the probe is inserted fully into the Z rack and is located at its lowest possible position.
Slide the spring onto the probe and secure with the Locking Nut. Tighten the Lock Nut clockwise until the spring is compressed by approximately 50% as shown in Figure 7.



The Fluidic and Sensor path for the XSP-220

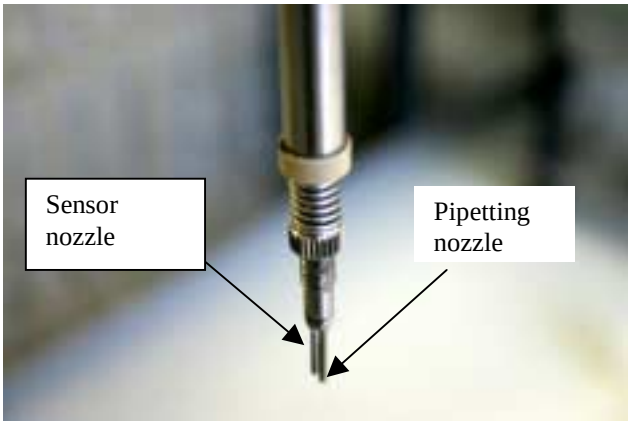


Figure 7

Apply a very small amount of silicone grease onto the thread.

DO NOT ALLOW ANY GREASE TO TOUCH THE NEEDLES AS THIS MAY CAUSE THE LEVEL SENSOR TO FAIL.

Screw the tip adaptor onto the thread.. After approximately 3 turns it will suddenly become much more difficult as the thread on the adaptor is tapered . From this point you should continue to turn the adaptor by approximately ¾ to 1 turn which will ensure a good gastight seal. Use some fine emery cloth (P600) or rubber gloves to grip the adaptor if necessary.

Now turn the locking nut anti-clockwise so that it is tight on top of the tip adaptor. The spring should now be fully uncompressed and the gap between the top of the adaptor and the bottom of the Z rack approximately 12 mm. As shown in Figure 8.

Figure 8

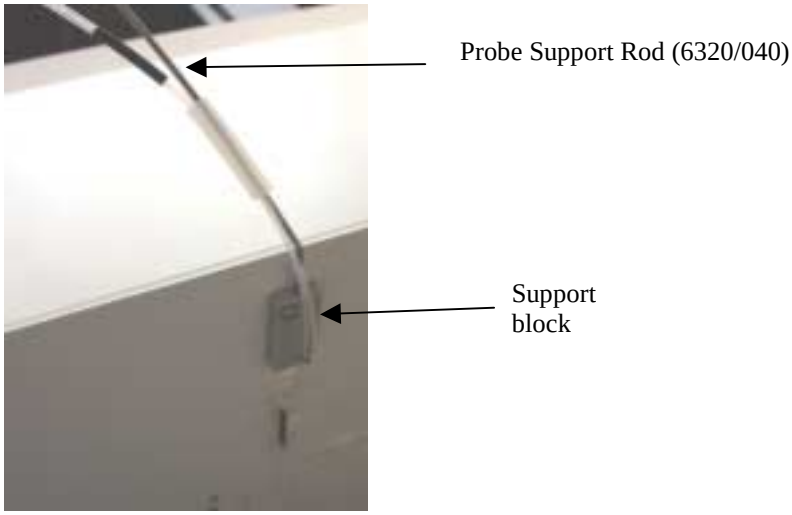


Figure 9

Screw the connector of the larger diameter tubing into the left-hand port (viewed from the side) of the syringe valve (Figure 11). This is marked Small Probe.

Screw the connector of the smaller diameter tubing into the Pressure Sensor port on the back panel. (See Figure 10)

Insert the Probe Support into the Support Block. Adjust the position of the sleeve along the probe so that the probe is supported as shown in Figure 4. Clip the probe tubing into the loop of the Probe Support, which should be bending towards the front of the instrument.

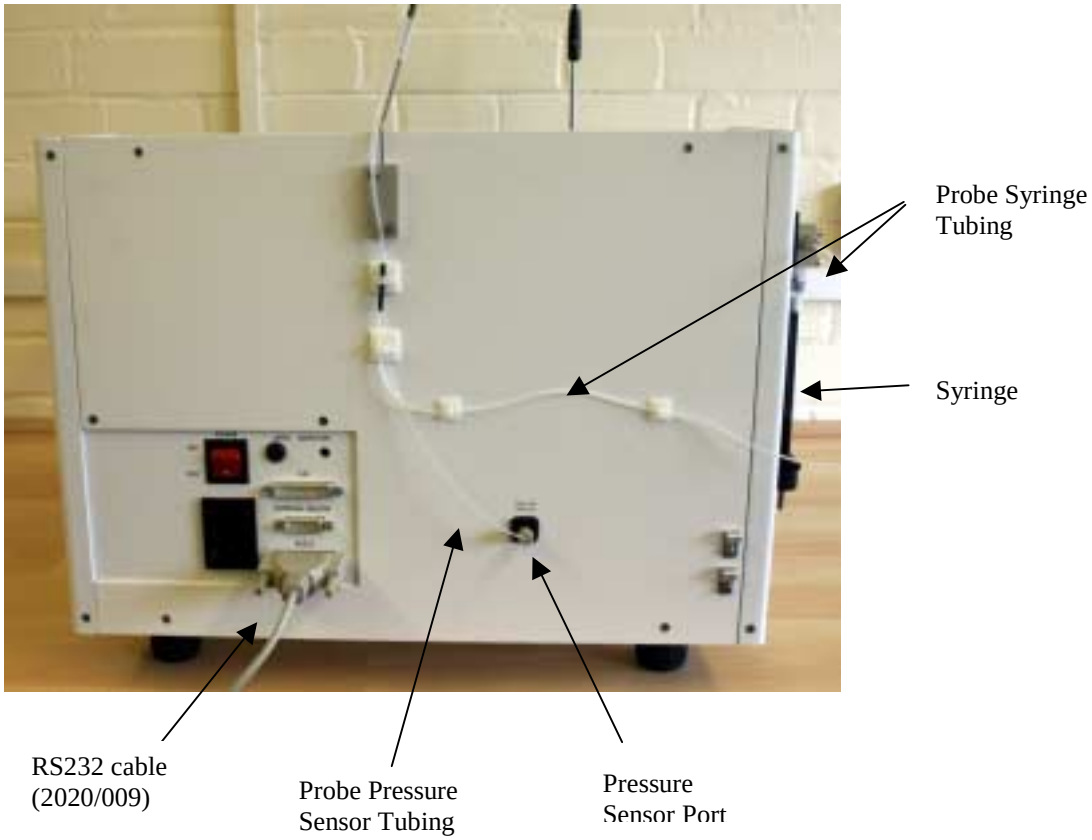


Figure 10

3.6.2 Modes of operation

There are two methods of operation with the XSP-220 DT and this affects the number of tubing connections required.

When operating in the "Wet" mode, the syringe and probe are primed with distilled water. At various intervals during processing the probe will pipette a small volume of liquid into a washbowl (if fitted) or a container. A system fluid bottle supplies the syringe with distilled water.

When operating in "Dry" mode, the syringe and probe tubing are left empty. This simplifies the processing and removes the requirement for system liquid, associated bottle, Washbowl and waste collection.

"Wet" mode will give the best reproducibility as the amount of air in the system is minimised. "Dry" mode is a slightly simpler configuration and is more than adequate for pipetting operations where the reproducibility is not critical such as in sample archiving.

Note that in "Dry" mode although the hydraulic path between the syringe and the probe is left dry, the syringe itself needs to be lubricated with a small amount of water or Silicone Oil to ensure the pistons do not wear out.

3.6.3 Connecting the System Fluid Bottle (Wet Mode Only)

The System Fluid Bottle (See Figure 3) is connected to the instrument by a single length of tubing terminating in a threaded syringe connector. This connector should be screwed into the right hand port of the syringe valve. The other end of the tubing should be inserted through the small hole in the blue cap. There is a short length of rubber sleeving which should be slipped over the tubing and positioned in contact with the underside of the blue cap. The position of the sleeve should be adjusted so that the tubing rests on the bottom of the System Fluid Bottle when the cap is in place.

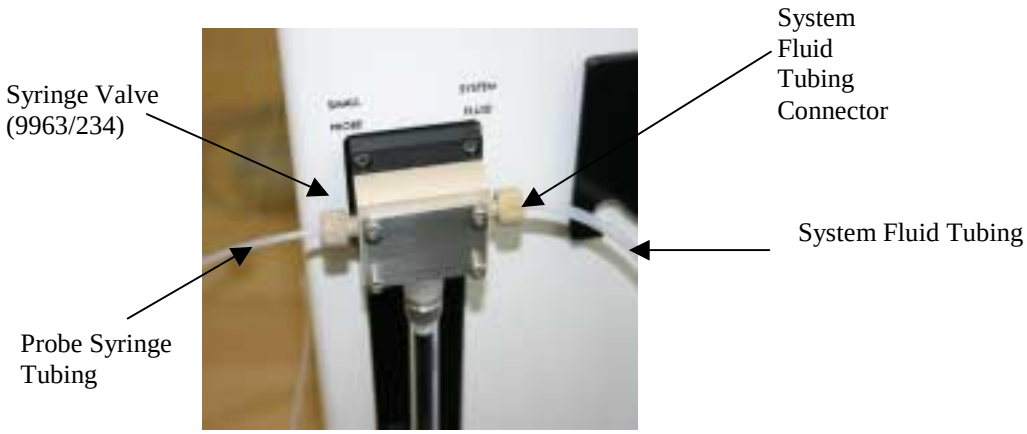


Figure 11

Note: It is not necessary to connect the System Fluid bottle if you are only intending to use "Dry" mode.

3.6.4 Washbowl Tubing connection

The Washbowl is connected to a length of silicone rubber tubing (7600/228). This is installed by pushing it onto the spigot that protrudes from the washbowl underneath the Deck. Get someone to help you by lifting the instrument up at the front whilst you fir the tubing.

The other end should be inserted into a waste container such as a 5 litre flask. Note that the waste system relies on gravity so the path of the tubing should be level or downwards but never upwards or you will get airlocks and the waste will not drain away correctly.

3.7 Installing the racks

Each of the racks is located on the bed using one or more rack locators. These engage in a locating hole which is present on the bottom plate of the rack. The locators are screwed onto the black rail that runs along the front and the back of the deck.

In the DT Applications the following 3 racks are normally supplied as a minimum:

RACK TYPE	NORMAL LOCATION ON DECK
Disposable tip Rack Block	At rear – left or right.
Tip Waste Bag Support	Front left
Sample/Source rack	Middle
Destination rack	Right-hand side

There are a number of variants on each of these rack types. The precise type supplied will depend on the sample tubes and reagent containers you are using and the positioning on the deck will depend on the application.

When you take the instrument out of the box the locators will normally be fitted to the rail ready to locate your racks.
Do not move the rack locators unless you know you have to e.g. when installing a different type of rack.than the one(s) supplied with the instrument. Always check that the probe can physically access all the positions in all of your racks before “Defining Areas”. This is the process, described later, where all the coordinates are defined.

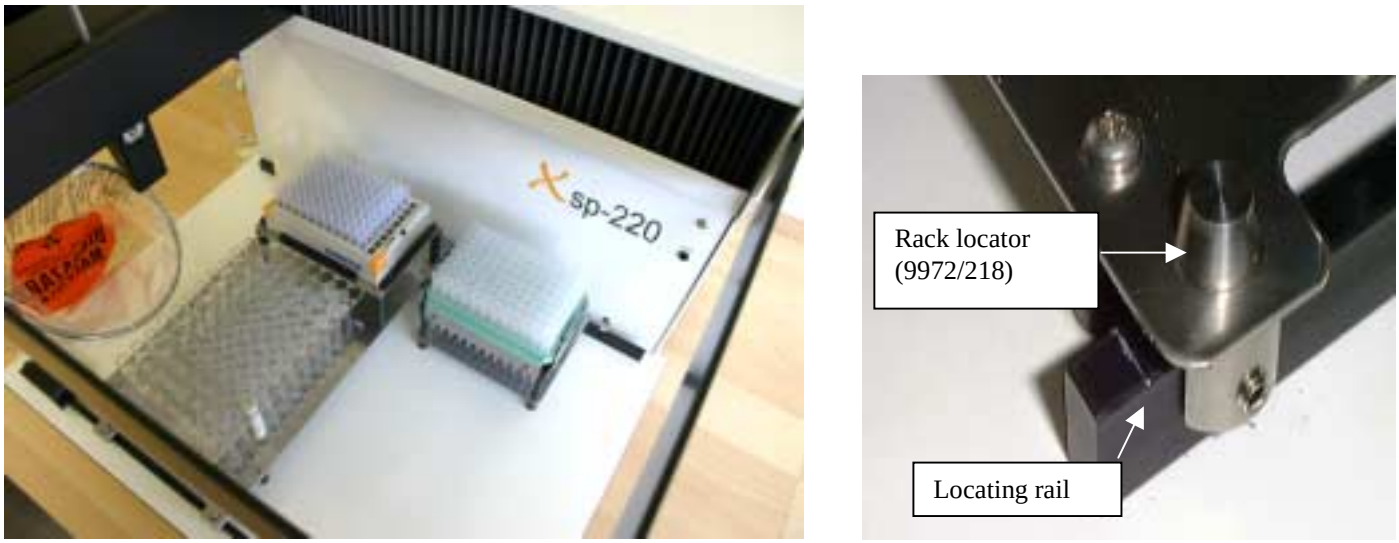


Figure 12

3.7.1 Installing the DT Rack

The type of disposable tip rack supplied will depend on what types of tips you intend to use. The rack will usually comprise one or more locations for either a box of tips or tip refills.

The rack must be located at the back of the instrument using the locking rack locators. These have a washer and screw to allow the rack to be secured and to prevent it from being lifted by the instrument accidentally during operation.

The photos in Figure 13 show the rack before and after the rack has been secured.

DO NOT OVERTIGHTEN – FINGER TIGHT IS ADEQUATE !

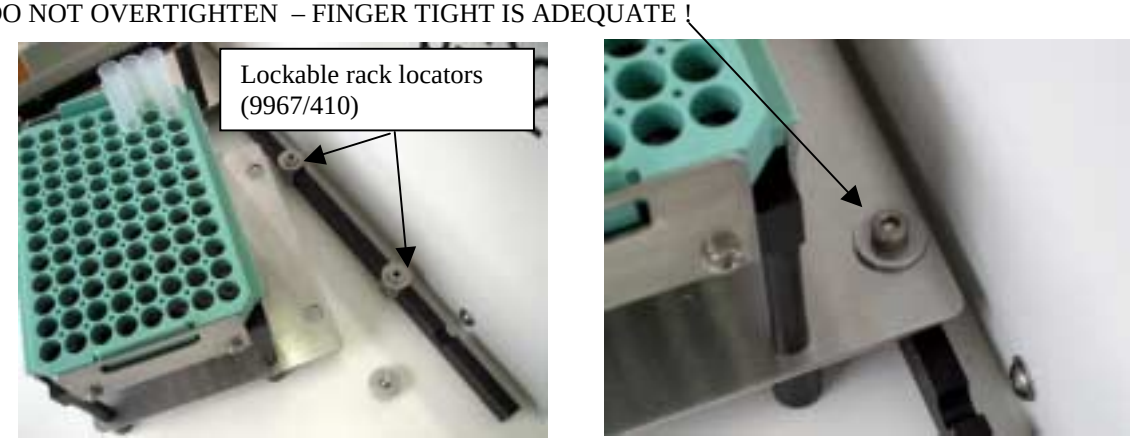


Figure 13

3.7.2 Installing the Waste Tip Bag Support

Waste Tips are collected in an autoclavable bag which is supported by an adjustable support loop. The base of this unit is fixed to the locating rail by means of 2 grubscrews. This item will normally need to be fitted as it is not shipped in position. It should be located at front left or back right location so that the highest part of the loop is nearest an outer edge of the instrument as shown.in Figure 14

Figure 14 Waste Tip Bag Support (3476) Waste Tip Bags (MME 9361)

3.7.3 Installing the Sample & Deepwell Rack

This is located on the 2 rack locators on either the front or rear locating rail. The rack comprises 96 sample tube positions and a single SBS format microplate location at the rear. The 4 black anodised locating bars are adjustable to accommodate the slight differences in the sizes from different manufacturers.

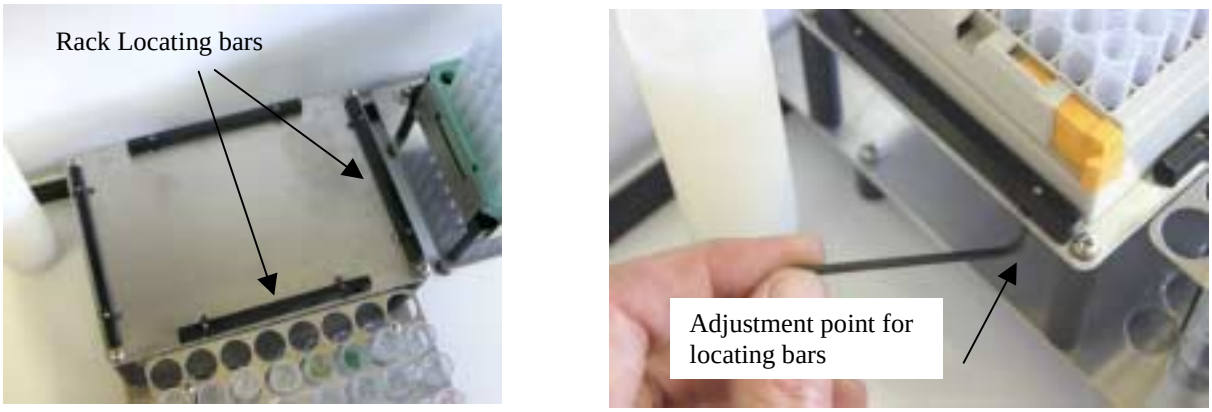


Figure 15

3.7.4 Electrical Connections

The power cord may now be fitted into the back of the instrument. Leave the instrument switched off.

Plug in the 25 way end of the RS232 cable into the socket as shown in

Figure 10.

3.7.5 Checking the arm is level

To achieve optimum performance and reliability it is essential that the instrument arm is level. The most critical location is the disposable tip rack as any differences here can result in unreliable tip operation. It is therefore recommended that you check that the probe tip is completely level (+/- 0.2mm) with the top of the tip rack across all 96 positions.

1. Make sure the instrument is switched off. When it is switched on the instrument motors are energised and it is difficult to move the arm manually.
2. Make sure that the tip rack is in position and on its rack locators securely. Ensure that the rack is sitting absolutely flat on the deck. You may find that if the securing screws that hold the rack down onto the locators are too tight it may cause the rack to “rock”. These screws only need to be “finger-tight”.

Figure 16

3. Push a tip onto the probe and move the probe manually so that it is positioned just above the tip rack
4. Move the probe down so that the probe needle is within 0.2 mm (approximately the thickness of 2 sheets of photocopier paper) of the black top plate.

5. Move the probe to different positions within the rack and observe any differences in the gap.
6. Compare the distance between the probe and the top of the rack at the front and back and left and right hand side of the rack. This is best done viewing from the side

If the height difference is >0.4 mm the arm may require realigning or the rack itself may need to be adjusted. You should consult your service engineer to perform this procedure before defining any areas..

ALWAYS MAKE SURE THE INSTRUMENT AND ARM ARE LEVEL BEFORE DEFINING ANY AREAS

3.8 Connecting to the power supply

Having installed the racks and checked that the instrument is level you may now connect the power cord.
These instruments are fitted with a variable voltage power supply which must be fitted with correctly rated fuses to ensure maximum protection. The fuse rating is as follows:

115 to 240 Volts - 2 Amp fuse

Note that both neutral and live are fused.

3.8.1 Power cord

Where it is not known what plug type is required the power cord will be supplied without a plug. If this is necessary make the following connections: -

Live (Line)	Brown
Neutral	Blue
Earth (Ground)	Green/Yellow

It is essential that an earth be connected to any liquid handling equipment, especially if it has a filter fitted. If a fused plug is used, it requires a 3-amp fuse.

4 Software Installation

4.1 Computer Minimum Specification

HARDWARE	DETAILS	COMMENTS
Processor	Pentium II	
Processor Speed	500 MHz	
Memory (RAM)	64 Mb	
Hard Disk	6.4 GB	
Optical Drive	CD-RW	Required for making permanent backups
Serial Port	1 x RS232	For communication with the instrument
Sound card (integrated or separate card)	Sound card + speakers	Used for audible warnings
Printer	Most should work but should be tested first	For printing of Worklists
OPERATING SYSTEM	Microsoft Windows XP Professional (Service Pack 2)	Vista not yet supported

It is also strongly recommended that you incorporate a writeable e.g. CD-RW drive for backup purposes as some of the files are larger than 1.4 MB. A memory stick may also be used but the files must be archived to a disk so that a permanent record is kept. It is also recommended that you purchase a printer with a USB connection.

Please note that HTZ only supports the English Language Version of Windows XP. If you are unable to obtain this version or need to use another language version please contact HTZ first for advice.

4.2 Software Overview

If the PC was supplied with the instrument the software will have been installed and configured at the factory. However, if the PC was sourced locally it will be necessary to perform the software installation procedure described below.

There are 3 main components to the Xsp 220 Software supplied on 3 CDs:

1. "VisProg System" – the main instrument control software.
2. "Applications Software" – a specific piece of software for an application on this configuration of instrument.
3. "Instrument Configuration" - XYZ calibration data for an individual instrument.

Each of these disks needs to be installed.

4.3 Visprog Installation (New Installation)

1. Insert the disk labelled "VISPROG2 Installation and Set-up" CD into the CD drive of the computer.
2. The program should now automatically load. If it does not, locate and run the SETUP.EXE program located in the root directory of the CD by selecting the Windows Start button (Start, Run, and Browse).
3. Follow the screen prompts pressing the Next Button when prompted.

4. Accept the default Program Folders Directory (See Figure 17) and click Next

Figure 17

5. Click Next on the “Start Copying Files” prompt. The Visprog software will now be installed on the computer in the C:\KWINSP directory.

After re-booting the computer the following 6 icons will be displayed on the desktop.

Figure 18

The 6 programs shown above in the program selection window represent the main VisProg System Software programs. They have the following functions:

PROGRAM NAME	**FUNCTION**
CONFIGURATION	Used to set up various instrument and software options such as password definitions, which Serial Port to use and whether to use the software on-line or off-line etc.
DIAGNOSE32	This shortcut **should be deleted** as it is not applicable to this system
RUNTIME32	The program used to actually drive the Xsp 220
GUARDIAN SPREADSHEET	Program used for processing Worklists
SETAREA32	Used for defining the co-ordinates of racks
VISPROG2 (or VISPROG32 on earlier versions)	Used for creating new applications (requires dongle). **This shortcut should be deleted** as it is not applicable to this system

Note that some of the shortcuts refer to programs that are not used by the by this specific instrument and may be deleted.

4.4 Application Installation (New Installation)

4.4.1 Running Set-up

After installation of the Visprog2 disk you must now install the Application software. Always install the Visprog2 before installing the Application Disk.

1. Insert the disk labelled Application Disk CD into the CD drive of the computer.
2. Locate and run the Set-up program located on the CD by selecting the Windows Start button (Start, Run, and Browse) located in the root directory of the CD. Follow the screen prompts pressing the Next Button when prompted.
3. Accept the default location for files and folders
4. Enter your name and the name of the organisation if prompted to do so.

4.4.2 File locations

The DT Applications software also installs a number of files into the C:\KWINSP directory.
It also creates a directory structure (C:\XSP) for the reading and processing of worklists.

It also installs a directory \Kwinsp\DefaultAreas that contains a set of default Area files (Rack coordinate files). These are examples and are not instrument specific. You may either create instrument specific Area files using the SETAREA32 program or you can copy those created at the factory.

4.5 Installing the Configuration Disk

An additional diskette or CD is supplied which contains a number of Area files that have been defined with your specific instrument during its testing. If this is the first installation of the software these files should be copied into the \KWINSP directory-using Explorer. Do not perform this step if the Area files in the \kwinsp directory have already been edited to match your machine.

This diskette will not necessarily contain a full set of all the Areas required by the software - only the ones that are defined and used during testing.

You may find that these files still need to be “fine tuned” as the positioning of the arm may have moved slightly during transit. The exact positioning may also be influenced by the flatness of the bench that the Xsp 220 has been installed on.

4.6 Instrument Configuration

4.6.1 Default Configuration

After completing the installation of the software the PC will now be configured to the factory setting. However, it may be necessary to change one or more of these parameters before the instrument will run correctly. In particular this applies to the Com Port setting. There are also number of other options you may like to change just to suit your specific requirements.

These changes are made using the Configuration program which is loaded by clicking on the Configuration icon on the desktop. For completeness this section describes all of the main configuration options that you would need to check if installing without a factory configuration disk. However, if you have one you can usually just check the Com Port setting and skip the rest as they should all be correct.

4.6.2 Instrument Type

Once the configuration program is loaded there are a number of menu options. Select the Instrument Type as “Other Models” in

Figure 19

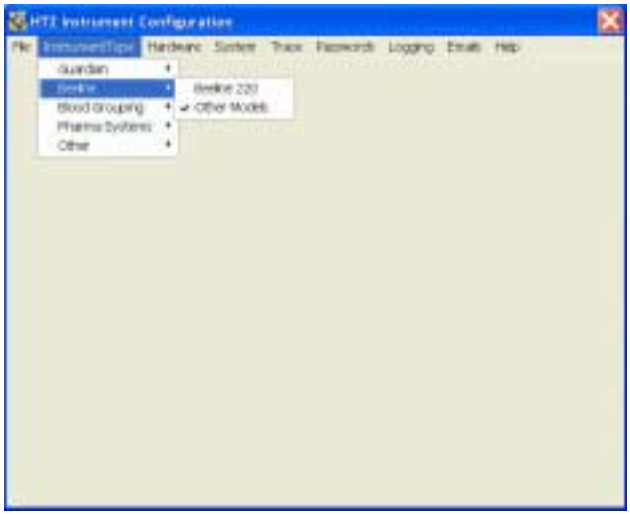


Figure 19 Instrument Type

4.6.3 Hardware

4.6.3.1 Instrument OnLine

You will be prompted (as shown in Figure 20) to specify whether the instrument is Online or Offline. (This prompt is the same as is also displayed if you select the Hardware menu option). If you want to drive the Xsp 220 you should check this box. If you always want to run the PC in simulation mode (useful for checking Protocols without driving the machine) you should uncheck this option. If the option is checked the software can still be run in offline mode simply by switching the machine off BEFORE running the software although it takes a few seconds to establish the instrument is not present.

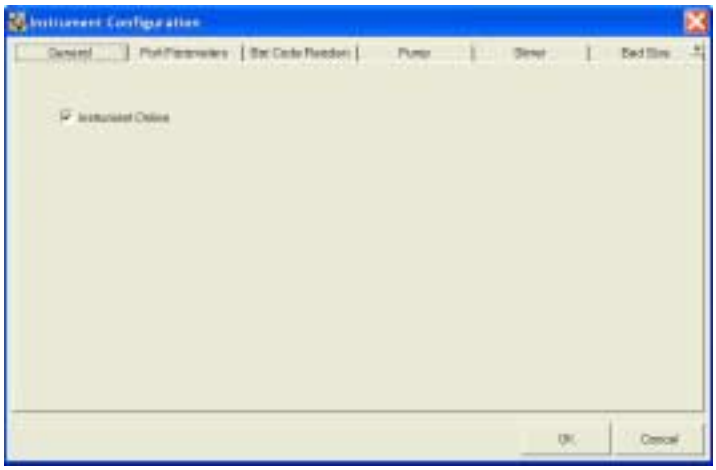


Figure 20 Instrument Online prompt

4.6.3.2 Port parameters for Serial Port

Enter the number of the Serial Port of your PC that is being used to drive the instrument. For desktop computers this is usually Port 1 but it does depend on the computer. For example, many laptops are set at Port 3. Remember which port you have selected and if the PC has more than one make sure the serial port cable supplied is plugged into the correct one.

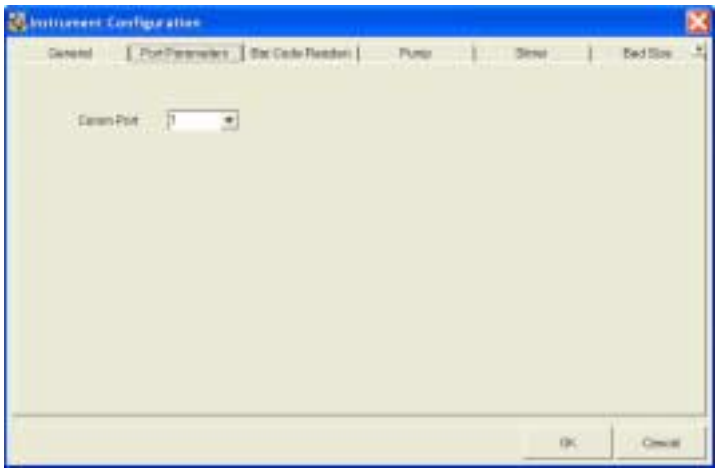


Figure 21

4.6.3.3 Port parameters for USB Port

If your computer does not have an RS232 port you will need to use a USB to RS232 converter (Part#). These plug into a USB port on the computer but terminate with an RS232 connector. The Com Port that your PC allocates to this device can be anywhere between 1 and 15. Check in Windows by looking in the Start > Control panel > System> Hardware > DeviceManager > Ports (Com & LPT). The example below shows COM10 in which case this number should be used as the Com Port number in the Port Parameters field above.

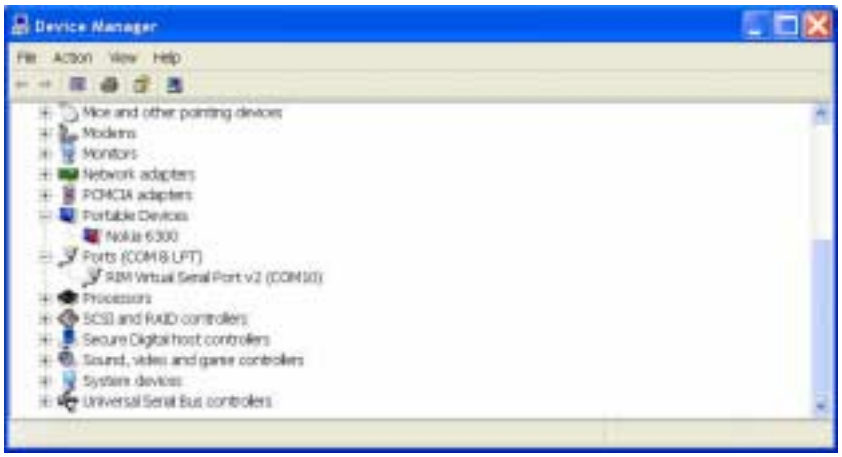


Figure 22

4.6.3.4 Barcode reader

The tabs labelled “Bar Code Reader”, “Stirrer”, Arm and Incubator are not currently applicable to the Xsp 220 and you should check that they are configured as not being present. The barcode reader option refers to an integrated barcode reader mounted on the arm. Note that if you have a wedge type manual barcode reader it is not necessary to configure this in the HTZ Configuration program as it behaves like an additional keyboard.

4.6.3.5 Pump

The tab labelled “Pump” defaults to a 1000 ul syringe volume. Make sure that this matches what has been supplied with the instrument. The DT machine may be supplied with a 2500ul syringe.

4.6.3.6 Security Cover

If you have a Security Cover but do not want the software interlock to operate make sure you choose the second option. The “No Cover” option should not be used if you have a cover fitted as the additional X movement will drive the arm into the right-hand cover.

Figure 23 Security Cover Configuration

4.6.3.7 Plate Incubator

Select this option only if your instrument is fitted with the microplate incubator option. If you check the Autorun option the instrument will switch on the incubator as soon as the Runtime software is loaded.

You will be asked to enter the temperature. This would normally be set at 37°C.

Figure 24 Incubator Configuration

4.6.4 System

4.6.4.1 Task Bar

The first option on the System Menu is the Task Bar. This controls which of the “Background” programs are displayed on the Task Bar at the bottom of the screen when the Xsp 220 is running. These background programs are so called because under normal operation you don’t need to use them. This configuration should therefore normally be set as shown below:

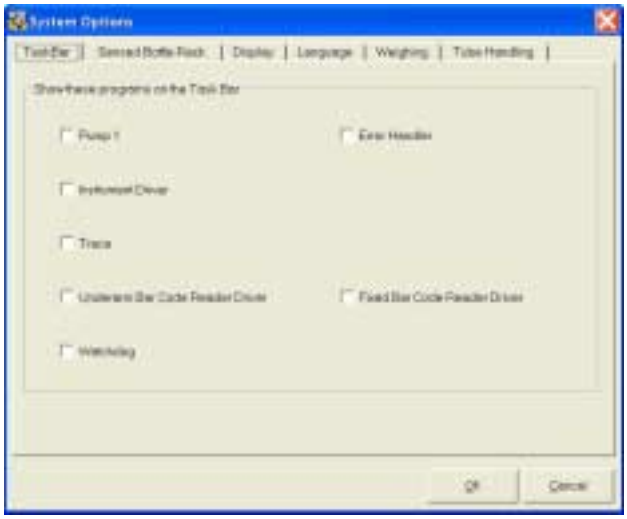
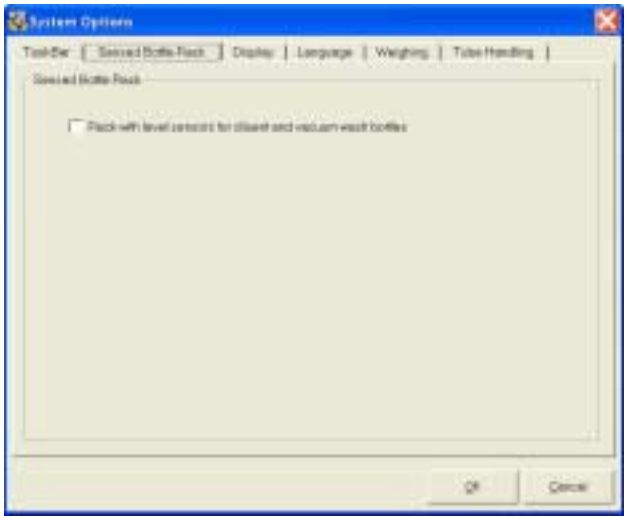


Figure 25

4.6.4.2 Sensed Bottle Rack

The Sensed Bottle Rack option relates to a set of special bottles incorporating sensors. These are currently not available for the Xsp 220 so this option should be unchecked.



4.6.4.3 Display

The “Display “ option configures the colour displayed for various liquid handling errors that may arise during processing. These colours are displayed when the instrument runs. Although configurable, it is recommended that you use the default values.

The “No Error” condition should always be configured to be a different colour from the other error conditions.

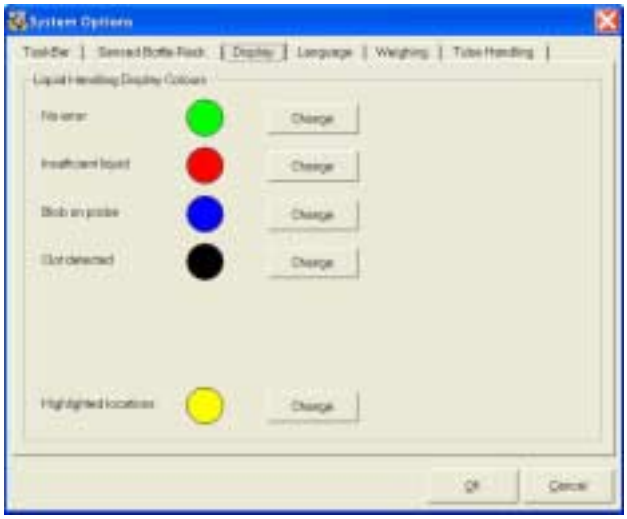
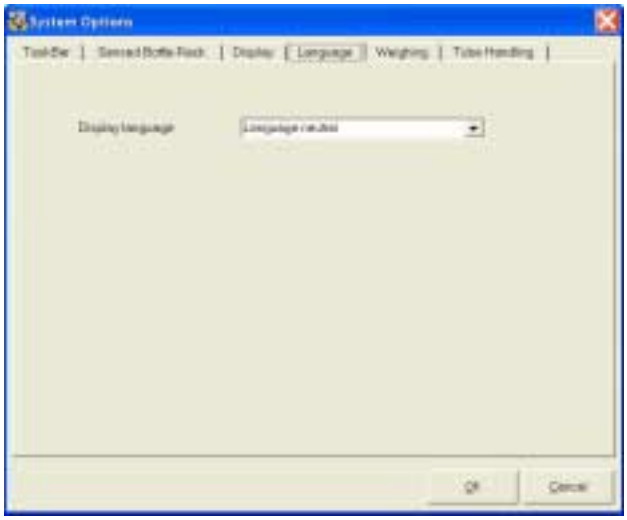


Figure 26

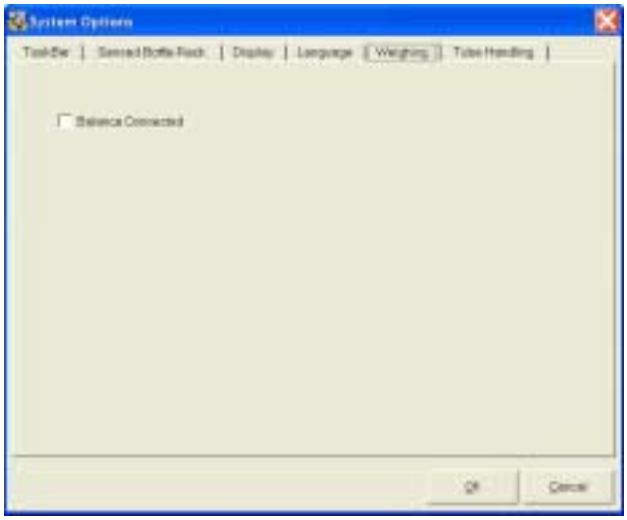
4.6.4.4 Language

This should be set to “Neutral” for English. No other languages are implemented at present.



4.6.4.5 Weighing

This option must be unchecked as it is not available for this application.



4.6.5 Trace

Select the Trace options tab. If you want Trace data files to be created for linking to a plate reader then check this Create Trace Files option. This will create a text file with the extension .ddd in the path specified. Ignore the remaining options (Identifiers, Database, Miscellaneous etc), as these are currently only relevant to systems incorporating an automated bar-code reader.

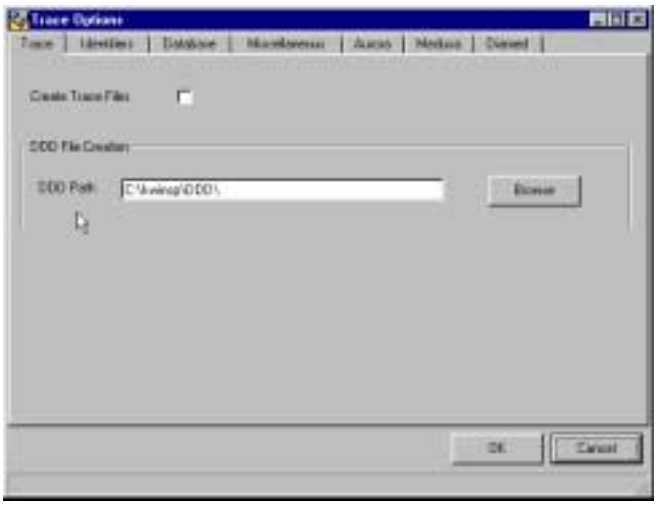


Figure 27

4.6.6 Passwords

When you first install the software onto a PC you will need to login to the password system in order to disable the default requirement for passwords.

Select Login and enter “supervisor” and “password” in lower case as the User Name and Passwords respectively.

Figure 28

Figure 29

You should then get a message to inform you that you are logged in. You may now “uncheck” the “Enable Password Protection” option.

Figure 30

4.6.7 Logging

Make sure that both the Link Log and Error Logs are both checked. These instruct the instrument to automatically record certain messages in a file (eg BEEDRIVE.LOG) which can be used by a product specialist to help find the fault. (See 7.3)

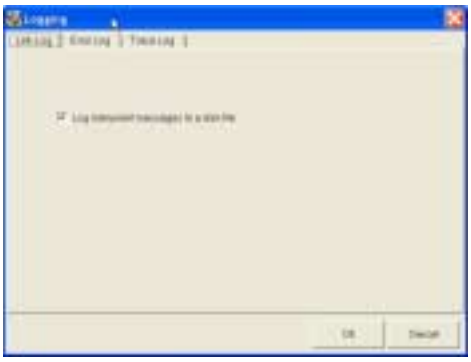


Figure 31

4.7 Updating Software

If you need to re-install or update the software you will first need to perform an uninstall.

Select Start > Control Panel>Add or Remove Programs

Scroll down and select Visprog2 and then select Remove

After completion repeat and select XSP-220 Applications and select Remove

You may now re-install both sets of software.

4.8 Operating System Settings

4.8.1 Windows XP Professional

If you opt to use certain features in the software such as Excel type spreadsheets as worklists, you will need to ensure that the Regional and Language settings match those shown in Figure 32 i.e. they need to be set as UK English.
You must also ensure that the settings for the decimal symbol and digit grouping character are in the standard English Language format (as shown below)

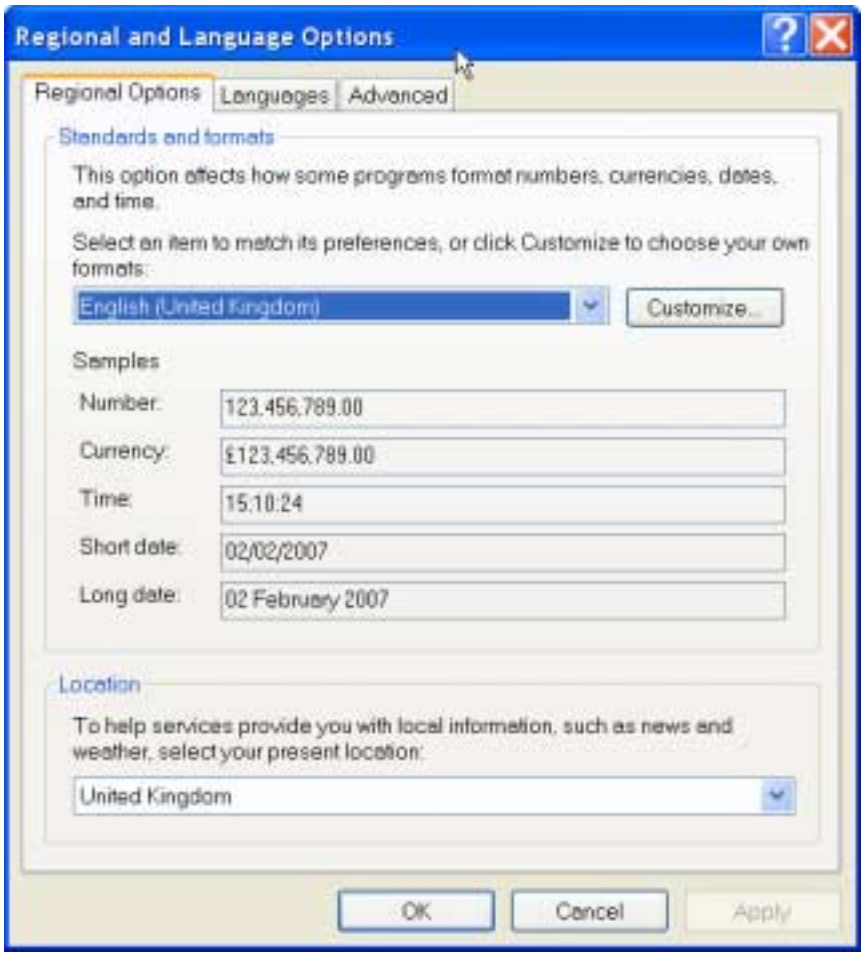


Figure 32

4.8.2 Windows Vista

Not yet supported

4.9 Dongle installation (USB)

The Applications Software is supplied with a security key or “dongle” (Figure 33) . This needs to be installed in the PC before the instrument will run the Application provided.

To install a USB security dongle simply plug it into any available USB port. Windows will prompt with the message “Found new hardware” and will proceed to install the software for the device automatically. You will not need a separate driver disk. Once completed you may need to reboot the computer to complete the installation.

The dongle is in effect the software license and is **very valuable**. A replacement will be charged at the full list price of the software so it is recommended that it is secured to the computer with a security cable as some may assume that it is a memory stick and remove it.

Figure 33

4.10 Switching on for the first time

The power switch is located at the rear right of the instrument. As soon as the instrument is switched on all motors (X,Y,Z and pump) will be energised. Depending on the version of firmware installed you instrument may “Home” itself. This refers to the process whereby all motions return to their 0 reference coordinate. The Home position is set at a position where the arm is at the extreme left-hand side (X=0) , the Z Rack is at the rear of the arm (Y=0) and the Z rack is in the up position (Z=0). The syringe will also drive to the top position.

If the instrument sounds as if the motors are struggling to drive one of the motions home and continually drive then switch the power off immediately. This can happen with the syringe drive if it has been driven manually or pushed up above its home position in transit. With the power still off move the piston down manually by pushing on the drive plate and switch on again. If the problem persists consult your service engineer.

5 Defining the Areas

5.1 Overview

This is the process of entering the co-ordinates for any racks, containers, microplates, etc. that the instrument needs to use – including the Washbowl, Tip Racks and the Waste Tip position. In outline the process involves moving the probe to certain key co-ordinates located on the bed and saving the data in a file called an Area File. This data can then be used whenever this item needs to be accessed by the probe.

Area Definition is performed using the program SetArea (or SetArea32- depending on version) which is loaded by selecting the icon on the desktop. The end result of the process is the creation of a number of files containing the precise coordinates of the various racks used by your instrument.

5.2 Area Files Used by the DT Application

The table below lists the default names given to the Areas required by the DT Application. All of these Area files need to be present in the main sample processor directory (C:\KWINSP). Although these names can be changed it is recommended that you leave them unaltered until you have familiarised yourself with the Applications software as any changes here also need to be reflected in the Applications themselves.

A Default copy of all of these will all be installed as part of the software installation procedure so you do not have to create these from scratch. However, you will at least need to check them and possibly edit them slightly.

AREA NAME	ITEM	USAGE	NOTES
WASHBOWL	The washbowl	Used for washing the probe when operating in “Wet” mode	The Washbowl Area Type allows for two positions to be entered but the Xsp 220 is fitted with a single position Washbowl therefore use the same co-ordinate for both positions
TIP1000	Rack for disposable tips	Uses to locate either boxed or refill type tips	
DTSAMPLES	96 position tube rack	Primary Sample tube rack	.
DTDEEPWELL	Rack for a deep well plate	For microplate or other SBS format item including deep well storage plates	
TIPOFF	Waste Tip Bag Support	Collecting used tips	Usually a single position only
DTTESTPOT	150ml container or similar	Test Area used for checking operation of instrument	Used to check the Z Motion is operating correctly

5.3 Pre-defined Area Files

When the files on the Configuration Disk are installed a set of pre-defined Area files will be copied into the main software directory (C:\kwinsp). These are the files used when the instrument was tested in the factory and are specific to your instrument. It is not essential to use them but it can save some time and it is recommended that you use them initially.

The co-ordinates in these Area files need to be checked and adjusted before operation in case of any small changes that may have occurred to the instrument during shipping.

5.4 To edit a pre-defined Area file

1. Double click on the SETAREA shortcut already installed on the Desktop -
2. Chose File > Open. This will display a list of the Area Files in the \KWINSP directory.
3. Select the file TIP1000 by highlighting it and by double clicking it.

You will now see a window which (usually) displays 4 separate blocks of data (Figure 34). This is all the information currently stored on disk for this Area. Another window also appears entitled the Virtual Joystick Figure 35 .This allows you to move the probe in the direction of the arrow and capture its coordinates in the Area Definition Window.

As an example if you chose TIP1000 you will see something like this:

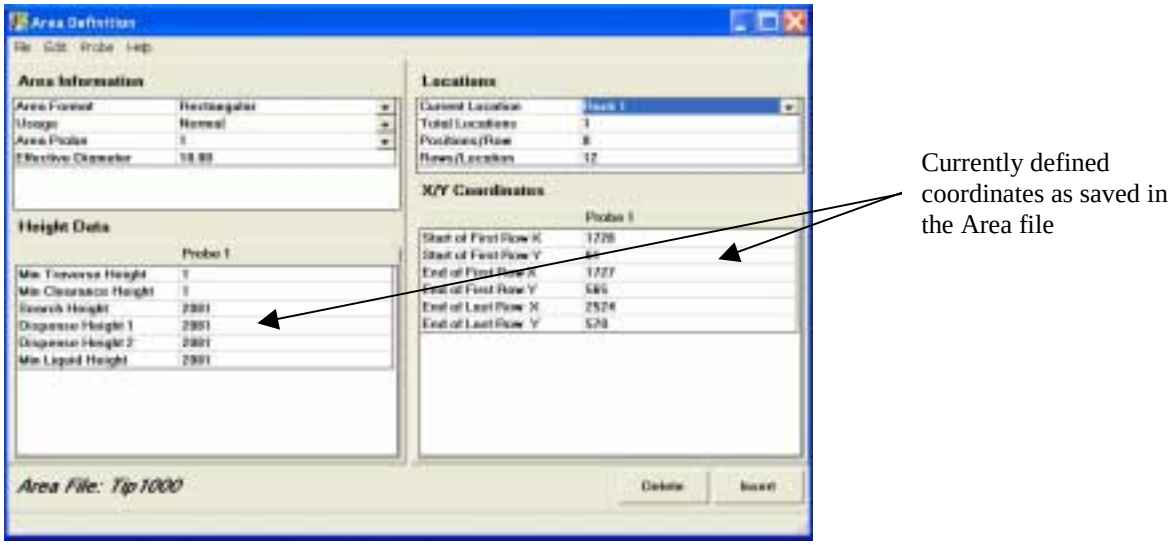


Figure 34

Normally when checking the coordinates of pre-defined Areas you only need to concern yourself with the Height Data and the X/Y coordinates. The parameters defined in the Area Information and Locations are therefore dealt with later .

5.4.1 Using the Virtual Joystick

Once the SETAREA program is loaded the instrument can be controlled by the Virtual Joystick. This window allows you to drive the instrument incrementally in any of the 3 axes simply by pressing on one of the arrow keys with the cursor. The basic objective of defining or editing the coordinates for the different Areas is achieved by moving the probe, using the Virtual Joystick, to certain key positions and then recording the X &Y or Z coordinates for the probe in that position.

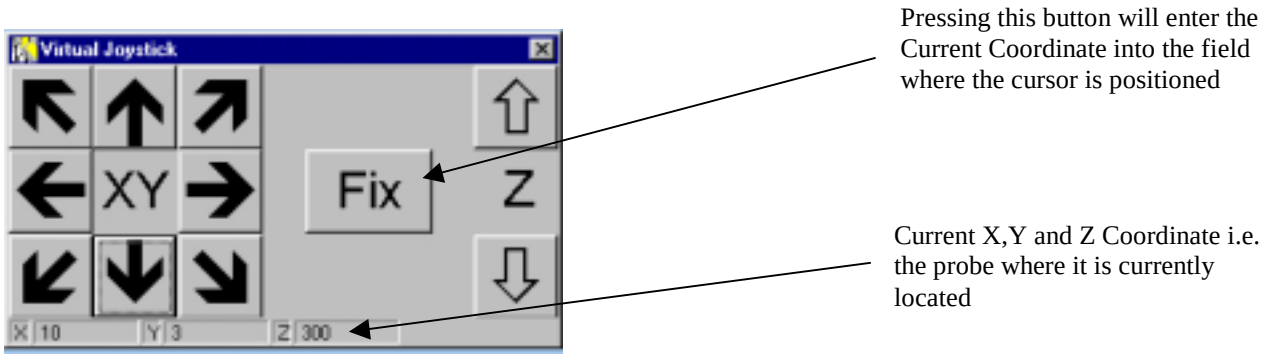

Virtual Joystick
XY
Fix
Z
X 10
Y 3
Z 300
Pressing this button will enter the Current Coordinate into the field where the cursor is positioned
Current X,Y and Z Coordinate i.e. the probe where it is currently located

Figure 35

The Virtual Joystick has 8 X/Y control arrows and 2 Z control arrows. The 3 fields below the arrows show the steps recorded by during the X, Y & Z movements from the start (Home) position. These steps equate to the following linear traverse movements in millimetres.

i. X Motion: 8 steps equal 1mm of traverse movement
ii. Y Motion: 8 steps equal 1mm of traverse movement
iii. Z Motion: 22.5 steps equal 1mm of up/down movement

Therefore with reference to the example shown in Figure 34 the Z movement from the home position down to the *Search Height* is 2081 steps. The actual linear distance moved is therefore 2081 / 22.5 = 92.5 mm approximately

To move the probe, simply move the cursor above one of the arrows and press. The probe will start to move slowly in small steps in the direction of the arrow. The size of the steps will gradually increase and the probe will accelerate. If you want to change back to a small movement at any time release the mouse button wait 2 seconds before pressing again. The speed will now have reduced. Take particular care when approaching a rack that is higher than the current height of the probe. You should make sure that the probe is moving in small increments.

5.4.2 Checking the pre-defined X/Y Coordinates

You can drive the instrument to any position on the deck using the arrow buttons. However, when editing a pre-defined Area you can also move the probe directly in a single move to a specific coordinate. This is useful when you want to quickly check the coordinates that have already been defined.

1. Move the cursor onto the Coordinate that you want to verify. The number in the field will align to the right when selected.
2. From the Area Definition Menu Bar select Probe > To Current XY

The probe will move to that position but will remain at the Minimum Traverse Height which is usually set at a value of 1.

To make a precise check you will need to move the probe down. You can do this either with the Z Down Arrow on the Virtual Joystick OR you can highlight a Z Coordinate in the Height Data pane and select the Probe > To Current Z.

To move the probe down, press on the Z Down arrow on the bottom right hand corner of the Virtual Joystick. Be patient – the acceleration in the Z is slow but be cautious as well as it does accelerate eventually. Again, if in doubt, go slowly and release the mouse button well before the probe is in danger of crashing into any object

5.4.2.1 Checking the pre-defined X/Y coordinates for the tip rack

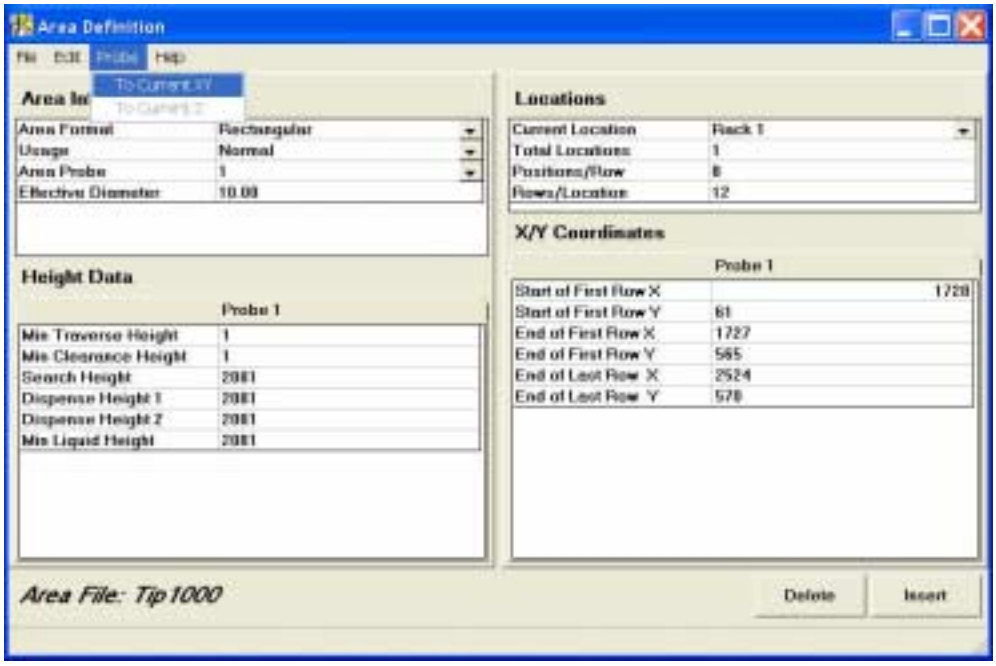


Figure 36

You will see that for the TIP1000 Area there are 3 pairs of X/Y coordinates namely:

Start of First Row (X and Y)
End of First Row (X and Y)
End of Last Row (X and Y)

A rectangular array such as the Tip rack, the Samples rack and the Deep Well rack can all be defined by means of 3 X/Y coordinates. You will see that the Location is defined as having 8 positions per row and 12 rows.
Also notice in the example above that the Y coordinate for the End of First Row is greater (565) than that for the Start of First Row (61). This means that the Start of First Row has been defined towards the back of the instrument. Remember that the Y home position (Y=0) is when the probe is at the back.

.

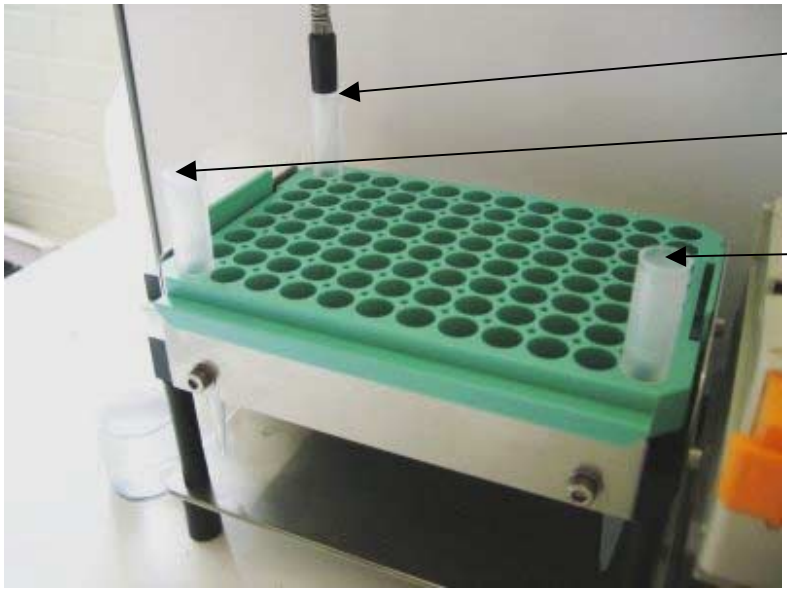


Figure 37

When defining the tip rack you should do this with tips in the 3 positions as shown in Figure 37

Select the *Start of First Row X* field using the mouse cursor.

Drive the probe to the position using the "Probe to Current XY. The probe should be central with respect to the tip.

If you find that the black tip adaptor is not central in the tip then move the probe into the correct position using the Virtual Joystick. Note that although there is a certain amount of side to side movement in the tip adaptor and Z rack you should ensure that its average position is in the centre of the tip. Having achieved that press the Fix button to overwrite the existing coordinate.

If no change is noted click the "FIX" button again to check fields have updated correctly.

The fields *Start of First Row X* and *Start of First Row Y* will now be updated to show the new values. The cursor will also be moved automatically to point to the next field indicated. You may use the "Probe to Current XY" to physically move the probe to this position. Repeat for the process the remaining positions i.e. End of First Row and End of Last Row

5.4.3 Checking the pre-defined Height Data Z Coordinates

Here we are checking that the Z coordinates for a given Area are correct.

You will see that there are 6 Height Data Parameters namely:

Min Traverse Height
Min Clearance Height
Search Height
Dispense Height 1
Dispense Height 2
Min Liquid Height

These control the height at which any are operations performed in this specific Area. The names are only a guide as to how they are used and are not all relevant to all Areas. For example the Area TIP1000 is used only for picking up tips and it is only the first 3 that are actually used.

For a full guide on where the heights should be defined for the different Areas refer to Table 1.

5.4.3.1 Defining the Heights for the tip rack (TIP1000)

The bottom left section of the Area Definition window shows the *Height Data*. To enter height data for a specific data point first make sure the cursor is over the relevant field and click it. The current number will shift from the left to the right hand side of the field and this shows it is ready to receive data from the Virtual Joystick.

For the TIP1000 Area set the Min Traverse and Min Clearance Heights to 1. You can do this just by typing in the number into both fields. In fact you can enter any coordinate this way.

The Search Height is the height used for picking up the tip and this is critical.

Set the Search Height to a point where the tip adaptor is inserted into a tip and the spring is compressed by approximately 50% of its original length. If you compress the spring too much you may get Z errors during the Definition process but also during operation. If you do not insert the tip far enough the tip adaptor may not seal properly and you could get dripping from the tip and could possibly fall off during a pipetting process.

When the Probe needle is at the correct height press the Fix button on the Virtual Joystick. This records the co-ordinate into the current field and moves it onto the next field. If you want to skip a field simply click the next field that is required with the cursor before pressing the Fix button.

A certain amount of trial and error may be required to get the optimum setting for this parameter.

Figure 38

5.4.4 Saving the changes

Having checked and or edited the coordinates in the TIP1000 Area you may now save them.
From the SETAREA Menu bar chose File>Save.
If you want to create another copy or have a modified version then chose SaveAs and give the file a different name.

Note: Area files are stored with a .A02 extension to the filename in the C:\kwinsp folder on the host computer.

5.4.5 Defining the X/Y and Z Coordinates for other Areas

The method just described can be used to check the coordinates for other the Areas. Refer to Table 1 for the information about what Height to set the probe for each type of Area.

5.4.6 Area Information

The upper left section of the Area Definition window shows the *Area Information*. The first field in this section specifies the *Area Format*. The Area Format selection will modify the rest of the display, as the Area data required is dependent on the type of Area being defined. For example, the Washbowl Type requires relatively few data points or parameters other than the co-ordinates. Other Formats such as the DTSAMPLES may require one or two more of the following parameters also to be entered.

5.4.6.1 Usage

Must be set to Normal as the other options do not apply to the Xsp 220

5.4.6.2 Area Probe

Must be set to 1, as there is only one probe

5.4.6.3 Effective Diameter

This is the internal diameter of the tube or container.

You should take care when setting this parameter for containers in which the probe will perform an aspiration step. It should be set to the internal diameter of the tube or bottle where the liquid could be held. This figure is used to calculate what volume of liquid is in the container. The volume calculation is also dependent on the height at which liquid is found and the Minimum Liquid Height.

This parameter also determines how fast the probe tracks down during aspiration. The smaller the diameter the further down it will travel for a given aspiration volume. In practice you may have to set the diameter a little smaller or larger than it actually is. However, it is most important that whatever you set it to, you check the probe remains in liquid during any aspiration step from the container. Running a “dummy” assay can usually do this.

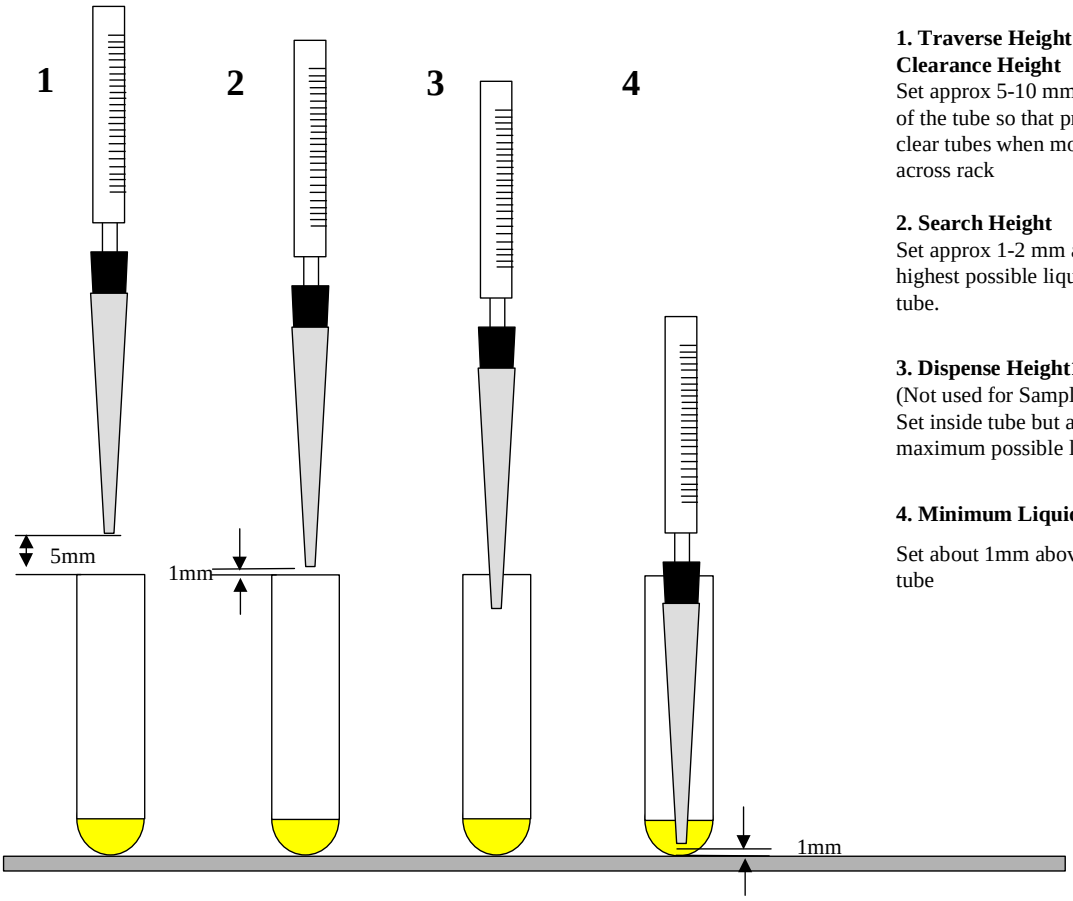
Note: This parameter is entered in millimetres

	GENERAL	WASHBOWL	TIP1000	DTSAMPLES	DTDEEPWELL	TIPOFF
Min Traverse Height	The height the probe needs to be at when moving into the Area. i.e. the tallest part of the Area. Note that you should usually define this with a tip fitted to the adaptor. For Safety set to 1.	Set to clear top edge of washbowl or to 1for maximum safety	With a tip fitted to te adaptor set to a height approx 5mm above the highest part of the rack.	Set about 5 mm above the top of the sample tubes or 1	Set to 2 mm above the top of the Deep well plate or to 1	N/A – only uses the Z home coordinate and the Z Negative Home (for ejection)
Min Clearance Height	The height the probe needs to be at when moving from one position to another within the Area. For safety this is usually the same as the Min Traverse Height	Set to height that probe can move within washbowl	Set to a height approx 5mm above the sample tube within the rack	As above	As above	N/A
Search Height	The height the probe starts searching for liquid from or, if the level sensor is off , the height from which it aspirates	N/A	This is the Tip Pickup Height. Set to a height approx where the spring is compressed by approximately 50 – 60 %	Set to the top of the Dilution tubes	Set to 0.5mm above bottom of tube	N/A
Dispense Height 1	The height which the pipetting needle dispenses from.	Set to same as Clearance Height	N/A	N/A	Set approximately 2 or 3 mm into the top of the tube	N/A
Dispense Height 2	N/A	N/A	N/A	N/A	N/A	N/A
Minimum Liquid Height	The bottom of the tube i.e. where it should stop looking for liquid. Also used as the lowest point the probe should ever go to	N/A	N/A	Set about 1 mm above bottom of tube	Set about 0.5mm above bottom of tube	N/A

Table 1 Recommended positioning of the probe when defining the Z parameters for different Areas

N/A = Not applicable (i.e. value is not used when processing this Area)

Height definitions for the Source and Target Area files



1. Traverse Height & Clearance Height
Set approx 5-10 mm above top of the tube so that probe will clear tubes when moving across rack

2. Search Height
Set approx 1-2 mm above highest possible liquid level in tube.

3. Dispense Height1
(Not used for Samples)
Set inside tube but above maximum possible liquid level

4. Minimum Liquid Height

Set about 1mm above base of tube

Figure 39 Height definition for Source and Target Area Files

The process described below is with reference to Figure 34 (TIP1000) Area but is applicable to the defining of the co-ordinates required by any single rectangular array as per a standard test rack or Microplate. but it is applicable to any of the other rectangular areas such as DTSAMPLES and DTDEEPWELL etc.

5.4.7 Locations

The top right section of the Area Definition window shows *Locations*

For an array of positions to be defined as a single Location, the distance between the positions within a Row must all be the same. For Locations with more than 1 row, the distance between all Rows must also be the same, however, the inter-row distance does not need to be the same as the distance between positions within a Row.

The data that is entered into the remaining two fields “Positions/Row” and “Rows/Location” depend on the size and type of rack being defined. In the case of the TIP1000 area it is usually defined as a Location with 8 positions/Row and 12 Rows/Location, as this Area is usually defined as either the rack containing the 96 1.2-ml dilution tubes or as one or more Microplates.

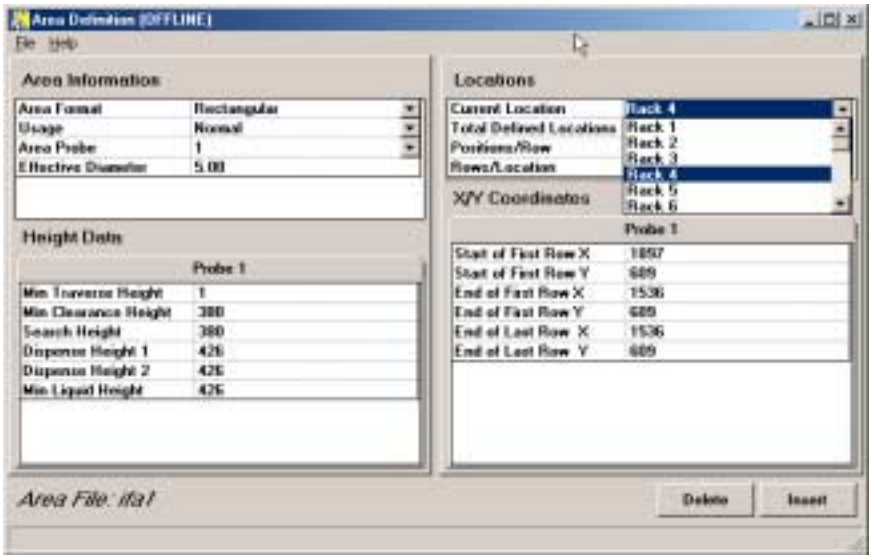
Most of the Areas used by this application are of a Rectangular type with a single location. However, some Areas can have multiple locations – e.g. a 4 position microplate rack . Each plate has to be defined as an individual location.

5.4.7.1 Inserting a new Location in an Area File

This is performed using the “Insert” Button at the bottom right of the window.

First move to the Location where you want the new Rack Inserted. (If the Area only has a single Location Defined ignore this step)

Press the Insert Button. This will insert a Rack immediately after the Current Rack. It will default to have the same number of Positions /Row and Rows/Location as the previous Location. This can be changed manually if required.



If you want to delete a Location select the Rack you want to remove and press the “Delete” button.

Figure 40

You can then define the X/Y coordinates for each location. Note that th Z coordinates are common for all locations within an Area as it assumes the locations are all at the same height.

5.4.8 WASHBOWL X/Y Co-ordinates

The Washbowl is usually only used by the Xsp-220 when the instrument is operating in Wet mode.

Only 1 position is required when defining the Washbowl,. Therefore to set-up the area needed move the cursor over to the first field *Flush Position X* and click it. Move the probe to the centre of the Washbowl using the Virtual Joystick and press the Fix button. This will record the co-ordinate for both the X and Y simultaneously and the cursor will move onto the next field named *Rinse Position X*. Press the Fix button again to record the same co-ordinate.

Save the data (File > Save)

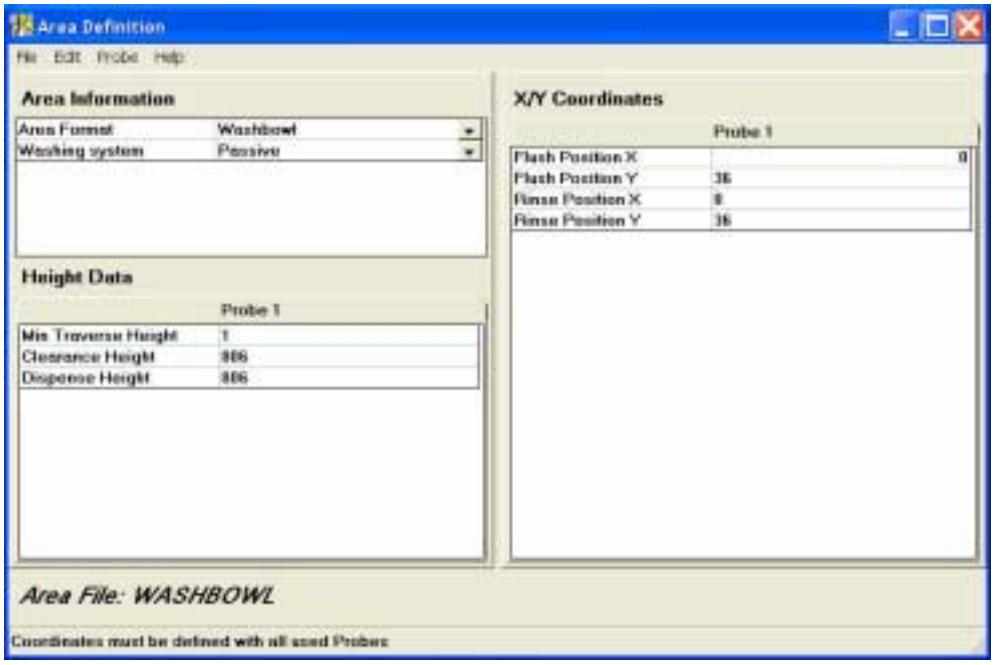


Figure 41

5.4.9 TIPOFF

The TIPOFF Area is defined as a special Area Format called Tipoff. It only requires a single X/Y coordinate which should defined immediately above the waste bag. No Z coordinates are required..(see Figure 42)

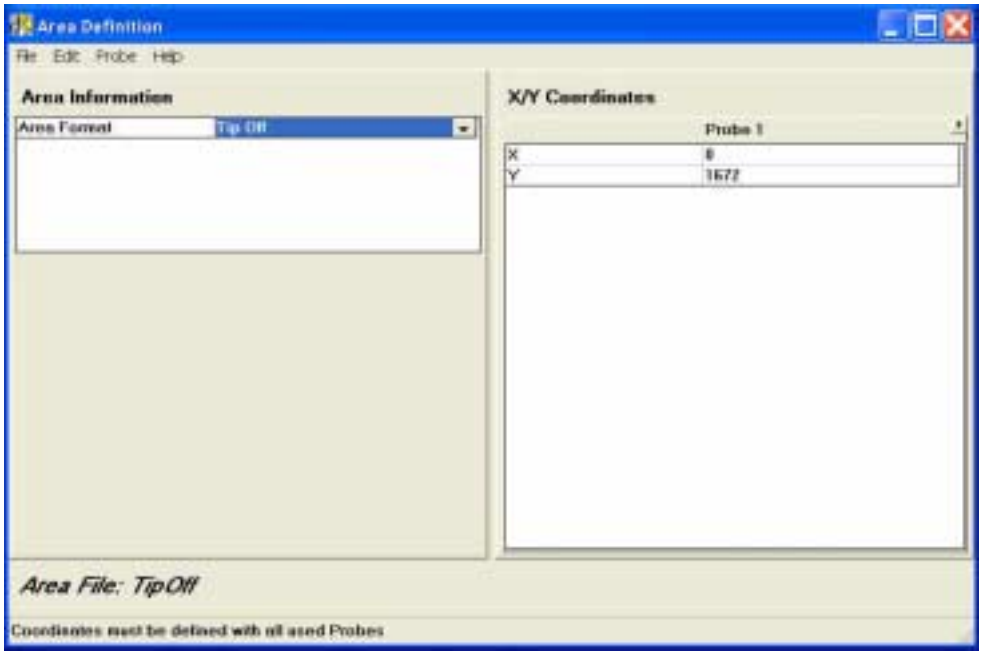

Area Definition
File Edit Probe Help
Area Information
Area Format
Tip Off
X/Y Coordinates
Probe 1
X
0
Y
1672
Area File: TipOff
Coordinates must be defined with all used Probes

Figure 42

5.5 Nudge Co-ordinates

This option is designed to allow you to apply a change to all of the X and Y co-ordinates in an Area. It is particularly useful if you are trying to modify the position of the probe within an Area which has a number of locations. It allows you to modify all locations by the same amount in either the X or Y direction.

The Nudge Co-ordinates option is available from the Area Definition Edit menu. The nudge can be applied to either the X or the Y co-ordinates and you can select whether it is just the Current Rack or all Racks within the Area that are modified.

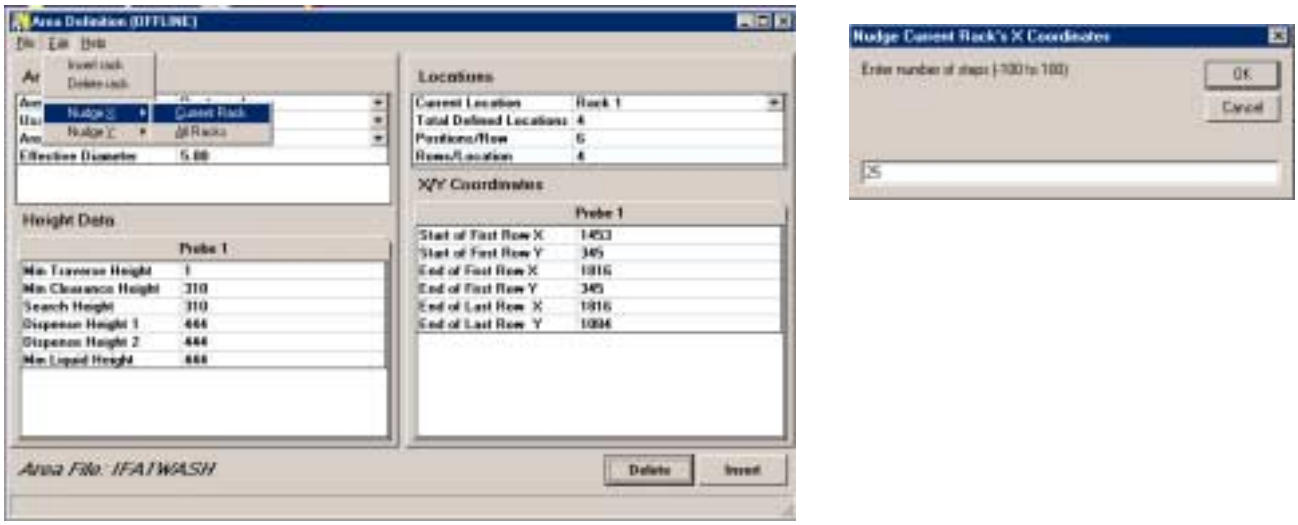


Figure 43

5.6 Backing up Area Files

Once defined and checked, the Area files must be backed up onto some removable media such as a CD-ROM. It is also useful to make a copy in a safe directory on the PC so that they are readily available.

The Area files that need to be backed up are the ones used by the installation and that have been defined for your machine. These are located in the \Kwinsp directory. These should not be confused with the Default Area files that are located in the \Kwinsp\DefaultAreas, which are effectively for reference only.

To back up your Area files:

1. Insert a memory stick or blank disk into a USB or CD drive of the PC
2. Load Explorer or My Computer
3. Locate the C:\Kwinsp directory and double click on the directory
4. Click on the Type field to sort out the files by type
5. Find and highlight all the Area files (*.A02)
6. Right click on the mouse and chose the Send to a USB stick or CD-ROM
7. Write the files to the CD

5.6.1 Liquid Level Following

When aspirating liquid from a container the probe will attempt to "follow" or track the liquid surface as it goes down. The probe will travel down in a number of discreet steps. The number and size of these steps will depend on:

1. The Aspiration Volume – The larger the volume the greater the number of steps
2. The Effective Diameter – The smaller the diameter the greater the number of steps
3. The Insertion Depth – The greater the specified insertion depth the fewer the number of steps

If aspirating a small volume eg 10 µl from a tube of 10mm internal diameter and with an insertion depth of 1mm the probe will not need to move down beyond the initial insertion to perform the aspiration. The level change will be less than 0.2mm.. However, if aspirating 200 µl the liquid level will fall by approximately 2.5mm so it will be necessary for the probe to move down to ensure the needle remains submerged.

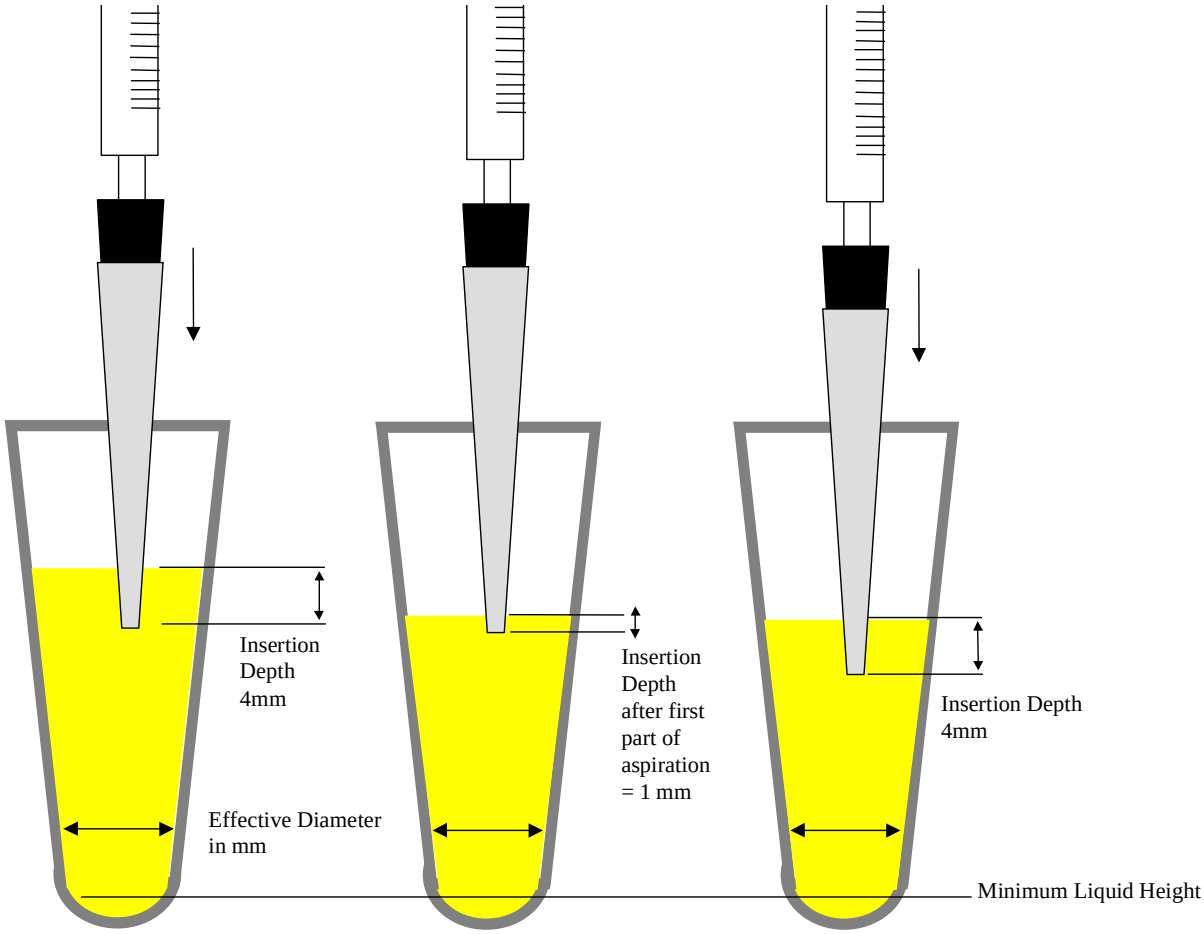


Figure 44 Liquid Level Following during large volume aspiration

When the instrument calculates that it has to follow liquid, it tracks the liquid down in a number of steps. The size of each step is controlled by the Insertion Depth specified in the protocol. If this is relatively large, eg 4mm, the pump will be able to aspirate a larger volume of liquid before the probe needs to moves down. This will tend to increase the speed of processing. The disadvantage is that a larger proportion of the needle's exterior surface will become contaminated.

Note that the depth is maintained at a minimum of 75% of the original insertion depth.

Figure 44 shows the probe movements during a large aspiration volume.

1. This shows the probe needle at the specified insertion depth prior to aspiration
2. Shows the liquid level after the first aspiration. Note that the probe remains 1mm beneath the surface.
3. The probe then moves down again to a depth of 4mm and is ready to aspirate more liquid.

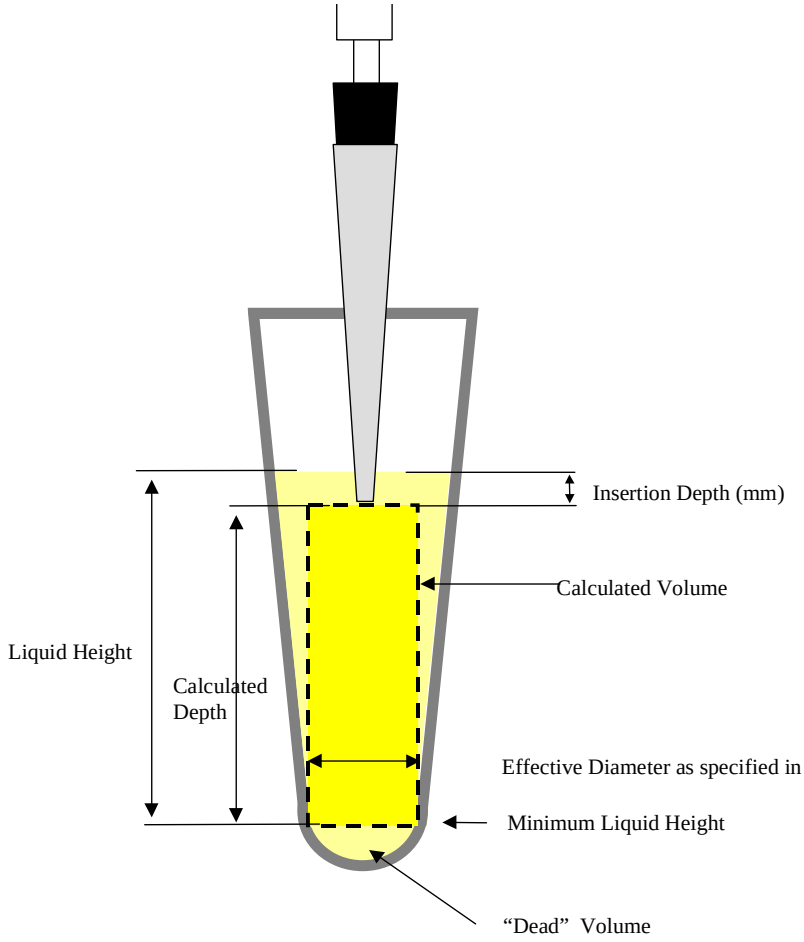
Note that if the distance between the Minimum Liquid Height and the current probe height is at any point less than the specified Insertion Depth, the instrument will give an Insufficient Volume error. In order to minimise the "Dead Volume" the insertion depth should be reduced to a minimum. However, be aware that aspirating a large volume with a small Insertion Depth increases the number of Steps required to perform the aspiration so it will reduce the throughput.

5.6.1.1 Tapered tubes

WARNING

When the internal diameter of a tube is smaller at the bottom than the top of the tube it is important to check that the probe remains beneath the liquid surface during the entire aspiration step, whatever the initial liquid level. This can be checked using the Utilities – Function Checks – Liquid Following Test.

5.7 Volume Calculation



VOLUME CALCULATION

The volume of liquid in a tube is calculated as follows:

Volume of a cylinder = $\pi r^2 h$

Where r = Effective Diameter / 2
and h = Calculated Depth
and Calculated Depth = Liquid Height – Insertion Depth

Many tubes have a larger diameter at the top compared to the bottom. It is important to enter a value for the Effective Diameter which is representative of the tube. If in doubt use a smaller diameter. This will help to ensure that the probe needles will remain under the surface of liquid during the aspiration

Figure 45

5.8 Area Definition Terminology

The following is a glossary of some of the terminology specific to the Area Definition process.

TERM	DESCRIPTION
Area	An item on the bed which needs to be accessed by the probe e.g. a rack, reagent bottle or the washbowl
Area File	A file containing the XYZ co-ordinates which defines how the machine will use an Area. An Area File will contain a set of 1 or more XY co-ordinates, which define 1 or more positions where each position can be used in the same way. An Area file may be used by more than one protocol to access the same rack for different processes provided that they can be performed at the same set of XYZ co-ordinates. A rack may be defined with more than one Area file so that it can be used for different functions if the co-ordinates are not identical. An example of this is where one process may require the probe to pipette at the bottom of a rack at the centre of a tube and another may require it to pipette at the top of the same rack and close to edge of the tube. This would require two separate Area Files to be defined for the same physical rack
Area Format	This describes the basic shape or configuration of the rack. Options include Rectangular (e.g. test tube rack or an array of reagent bottles), Singleton (a single reagent bottle), plus other specials such as Washbowl. Most Areas can be defined as variants of the Rectangular format.
Location	A part of an Area comprising one or more positions or rows. Depending on the complexity of the rack being defined an Area may consist of one Location or multiple Locations. An array of positions can only be defined as a single location if the following is true: The distance between each position within a row is the same The distance between each row (if more than 1) is the same The required sequence of processing (i.e. direction) for each row is the same
Rack	An item designed to hold one or more containers, test plates, slides etc. If an Area contains multiple locations these are numbered as Rack 1, Rack 2, Rack 3 etc
Row	The line of positions in a Location that defines the order in which the positions are processed. Processing normally proceeds in the direction of whatever is defined as a row. When it reaches the end of one row it normally proceeds to the beginning of the next row. See Page & Snake sequence below. Some Locations may only have one Row in which case the end of the first row and the end of the last row are defined as the same co-ordinate. When defining a Location you will need to specify the number of positions in a row and the number of rows per Location. When defining an Area with Multiple Locations these numbers will need to be defined for **each Location**.
Virtual Joystick	The software tool that allows you to move the probe to anywhere on the bed using the mouse.

6 Running the Xsp 220

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6.1 Preparing the Xsp 220 for Use

1. Switch on the power for the Xsp 220 (switch is at rear right-hand side of the instrument). The power switch for the Xsp 220 is located at the rear right hand-side of the instrument with the instrument facing you. The green power light on the front panel of the instrument should be illuminated. Switch on the computer and wait for the software to load

2. If using Wet mode ensure that the System Fluid/Diluent bottle is filled with PBS

3. Ensure the Waste bottle is empty and that the cap is securely tightened. Check that the “Open” gravity waste bottle (connected to the washbowl) is not full.

4. Make sure that all racks are securely in position and located properly on their rack locators. Pay particular attention to the Tip rack and ensure that it is positioned properly on its locators and that the ridges on the green plastic locating tabs are “clicked” into position and are beneath the stainless steel retaining clip.

Must be pushed down so that it “clicks” into position

Figure 46

5. Double click on the Run Xsp 220 icon. This loads the “RunTime” software that drives the instrument.

6. From the Protocols Menu at the top of the screen select the Start of Day option. This is used to prime up the instrument with Diluent – usually PBS. Follow the screen prompts. Whilst the instrument is priming check that the syringe on the left-hand side of the instrument is filling with diluent and that there are no large air bubbles present. The instrument is now ready to run.

6.2 Loading the RunTime Software

Load the Runtime software by selecting the Runtime32 icon on the desktop.

This will load the software that drives the Xsp 220. The arm and syringe should home themselves at this point - if they are not already there. Note that the syringe may take several seconds to home itself if the instrument has previously been switched off with the syringe at the bottom of its stroke.

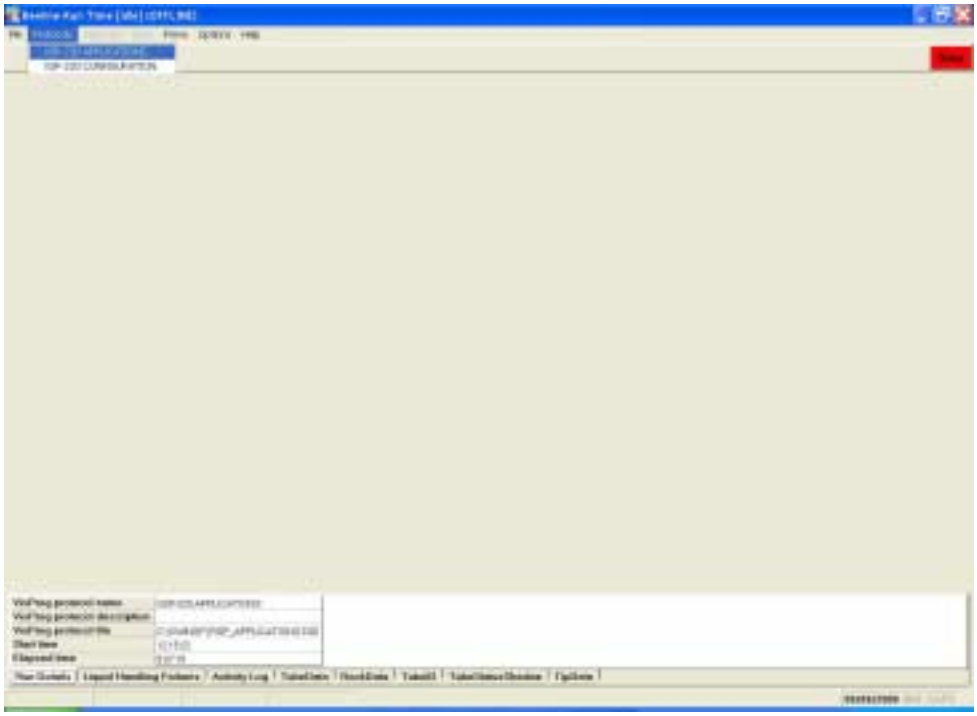


Figure 47

You will now be able to run a Protocol by selecting it from the Protocols menu shown at the top left of the screen.

6.3 Priming (Wet Mode)

At the beginning of the day you should run the Prime Option. This will ensure that the syringe and probe are fully primed with System Fluid. It is not necessary to prime if using Dry Mode.

6.4 Pre-run checks

Whenever running the instrument you should check that the:

- System Fluid Bottle has been filled (Wet mode only)
- Racks are all located properly and pushed down onto their locators
- New tips are loaded
- Gravity waste bottle is empty (Wet mode only)

6.5 Running an Application

To run an Application from the Initial Runtime screen (Figure 47)

Runtime > Protocols menu

Select the XSP-220 Applications option

You should now have a menu that looks like Figure 48

Figure 48

Additional applications options may also be displayed.

All the applications provided are associated with the pipetting of samples from a source rack to an Archive plate.
Each one is described

6.5.1 Archiving

If you select the Archiving application you will first be prompted to enter the number of samples you want to process:

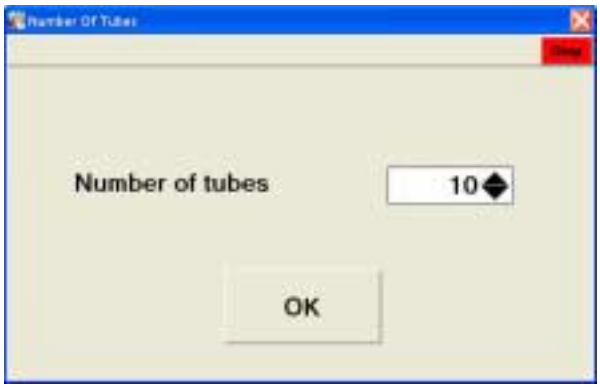


Figure 49

Next you will be prompted (Figure 50) to enter the name of the data file that will store all the data associated with this run.
A default name will be displayed comprising the letters RUN + a the current time and date stamp (year,month,day, hour,minutes,seconds). The default name is designed to be automatically unique and easily ordered when searching in Explorer with respect to the time the file was created.

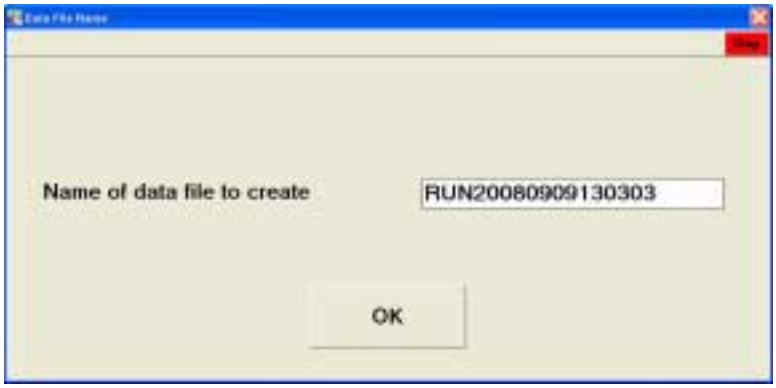


Figure 50

You will then be prompted to enter the barcode of the sample tubes. It is best to do this as you load each sample into the XSP-220 rack. The display also shows a representation of the rack with a pointer indicating the position of the next tube to be read.

You should enter the barcode using the “Wedge” reader or if damaged you may enter it manually.
To go back to the previous position simply enter a blank ID.

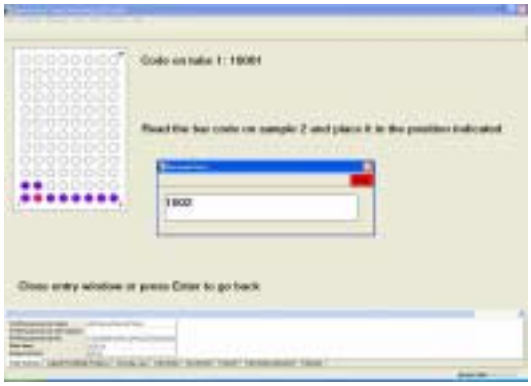


Figure 51

Finally you will be asked to asked to ACCEPT the entries and you will then be prompted to load both the target tubes and Source tubes (Figure 52)

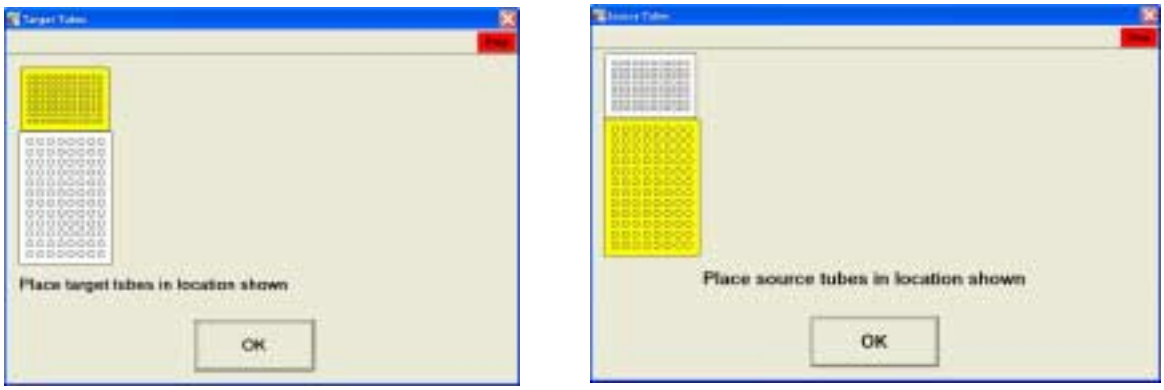


Figure 52

6.5.2 Archiving with Worklist

In this application the source tube identifiers are obtained from a separate file (CSV or XLS).
You will be prompted to specify the Worklist located in the C:\XSP\Pending directory that contains the barcodes for the samples you are about to process. You will not be prompted for the number of samples as this is specified within the file.
The processing information is also added to this file so you will not be prompted for "A name of data file to create"
Other prompts will be as per the Archiving application.

Figure 53

6.5.3 Load Samples

This application is used to create a worklist only. You will be prompted to enter the number of samples and the name of the worklist file to create. You will then be prompted to enter the barcodes of the individual tubes in the same way as per the Archiving application (6.5.1). The Worklist file will be saved but will not be processed. To process the Worklist you will need to run the Archiving with Worklist application.

6.5.4 Load Samples Sequential

This application is also only used for creating a Worklist. Instead of identifying the tubes you will be prompted to enter a "seed" barcode. This acts as the starting point for a series of identifiers that increment by 1. A code will be automatically generated for each sample requested and stored in the worklist for processing later.

Figure 54

The resulting worklist would look like Figure 54 with the SourceID column populated with numbers starting with the number you entered as the “Seed”.

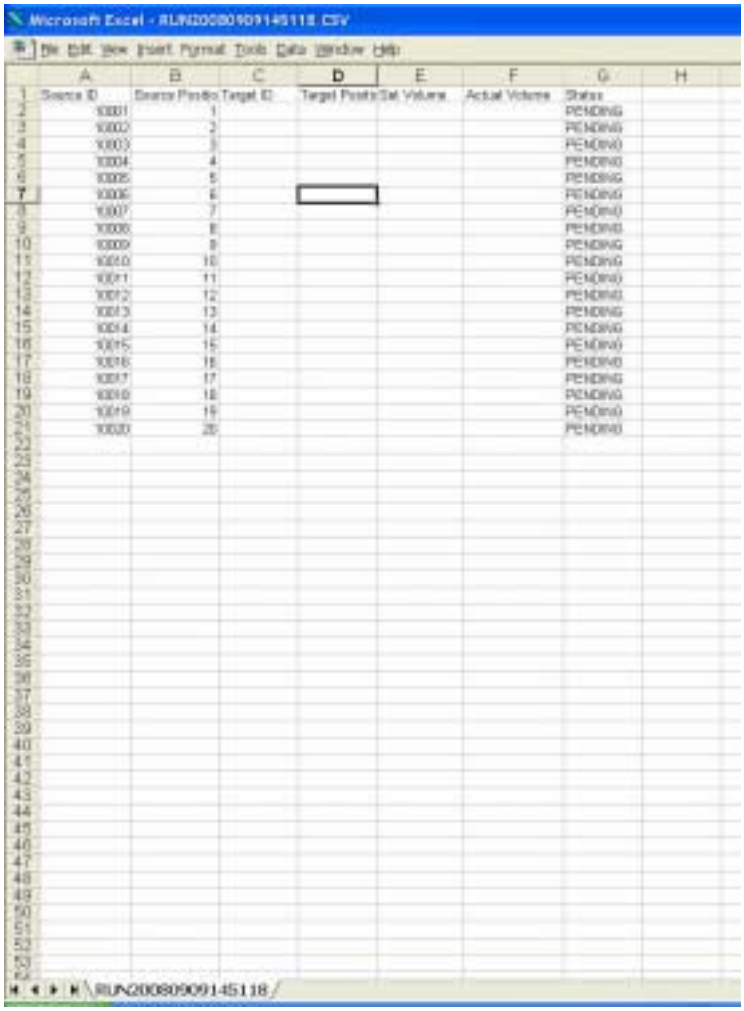


Figure 55

6.6 Processing Started

6.6.1 Startup

Once all the parameters required by the application have been entered the instrument the arm and the syringe will go home if they have not already done so. If there is a tip on the probe it will be ejected into the Waste Tip Bag. The syringe will also prime itself if required.

6.6.2 Tip loading

The probe will move to the Tip rack and attempt to pickup a tip from position 1. If none is found it will automatically move to the next position in the rack and try again until it "locates" a tip. The instrument checks that a tip has been loaded by means of the optical Tip Detector.

If the Tip rack is not installed correctly and the instrument is not able to move down smoothly it may detect a Z error. It will retry the move 5 times before finally displaying a warning allowing you to correct the fault or abort. If the Area file has been badly defined you will need to abandon the run, redefine the Area and restart.

If the instrument runs out of tips during processing the operator will be prompted to load more tips.

6.6.3 Interrupting Processing

You may interrupt processing at any time by pressing the STOP button on the screen or the Pause button on the keyboard. Pressing the <F10> key also works.

6.6.4 Screen Display

During processing a large amount of information is available about the processing.

The main screen displays a graphical representation of the deck showing which positions have been processed by means of coloured circles. If the position has been processed successfully it will show a green circle*. If any errors were encountered it will display a different colour depending on the error e.g. a red circle if insufficient liquid was detected in the tube.

In addition to the graphical display there are also a number of tabs at the bottom of the screen that record information in a tabular form throughout the processing.
The tabs include:

Run Details	Basic information on length of time processing the batch
Liquid handling failures	Records any liquid handling failures
Activity log	Records all processing steps, step by step
Tube Data	This is the Worklist
Rack Data	N/A
TubeID	N/A
TubeStatusShadow	N/A
TipData	Pressure measurements recorded during processing

6.7 Pausing and Stopping the Xsp 220

1. Emergency Stop
   If it is apparent that the instrument is liable to spill liquid, damage other samples, damage itself or appear to become out of control then switch OFF the power to the XSP 220 immediately. In less urgent cases proceed as below.

2. You may pause the instrument at any time by pressing the red STOP button. The instrument will pause and an option will be displayed which allows you to Abort Processing. If you want to continue then select the No option.

3. An alternative way of pausing is to use the F10 function key on the computer keyboard. Press it once and the machine will pause. Press a second time and the instrument will resume processing.

4. Note that the instrument will always complete the move or processing step it is currently performing before pausing so it may be a few seconds before it actually stops – especially if it is in the middle of doing a probe wash.

7 Fault Finding

7.1 Liquid Handling Fault Finding table

The following table lists some of the common problems that may arise when running the instrument. These are most likely to occur when the instrument is being used for the first time. Note that the colour of screen error codes (where shown) are the default values and may differ if the configuration has been customised.

Symptoms and Conditions	#	Possible Causes	Solution
1. Insufficient Sample or Reagent error but plenty of liquid present in container. Probe immerses in liquid to a depth significantly more than specified by the application typically to the bottom of container i.e. failed to detect the liquid Pipetting code on screen = Red Pipetting code in Activity Log = "Dry" or Insufficient	1	Liquid level detector sensitivity setting is set too low.	Adjust (i.e. increase) the level sensitivity in the DT configuration program
	2	Pressure connector disconnected	Connect it!
	3	Disposable tips are partially blocked or are being reused in a demo	Exchange tips for new ones
	4	Tip not picked up correctly because Search Height in tip rack Area not low enough	Redefine
	5	Search Height in Sample or Reagent Area set very close to or below the liquid level actually encountered.	Set Search Height higher to give time for Piston to start moving before probe encounters liquid
	6	Tip adaptor badly scored and leaking	Replace
	7	Pressure sensor tube has become wet. This can happen if the system runs out of liquid. when using Wet mode.	Remove Tip Adaptor and dry off. Purge pressure system with air using syringe provided.
2. Insufficient Sample or Reagent error but plenty of liquid present in container Probe immerses into liquid surface by 1 to 2mm (i.e.by normal insertion depth) Pipetting code on screen = Red Pipetting code in Activity Log = "Dry" or insufficient	8	Minimum liquid height in Area definition set too high. Although liquid surface detected it has calculated that there is Insufficient Volume (IV) to perform the aspiration step.	Redefine the Area and set the minimum liquid height to the bottom of the tube.
	10	Effective Diameter parameter in the Area definition is set too small. Although liquid surface detected it has calculated that there is insufficient liquid to perform the aspiration step.	Redefine the Area and set the Effective Diameter closer to the actual diameter of the container.
	11	Level detector sensitivity setting is borderline and not triggering reliably	Increase sensitivity

3. Probe stopped before reaching liquid surface during a search move No error generated Pipetting code on screen = Green Pipetting code in Activity Log = "OK" Probe aspirates air as it "thinks"it has found liquid. Subsequently fails to dispense correct volume	12	Sensitivity may be set too high and the surface liquid on the needle is triggering the level detector.	Reduce sensitivity of level detector
4. Probe stopped before reaching liquid surface during a search move Probe returns to Washbowl as it has "found liquid" before reaching the Search Height. Attempts to retry, fails a second time and returns to Washbowl Probe does a "dummy" dispense and moves onto to aspirate next sample Error is generated Pipetting code on screen = Blue Pipetting code in Activity Log = "Wet"	13	Probe has detected liquid on the probe before reaching the Search Height. In a Search move the probe moves down from the Clearance Height to the Search Height and then commences looking for liquid. If the level detector is triggered before reaching the Search Height an error is generated. The Probe has therefore "found" liquid before it should have. The Search Height parameter in the Area Definition may be set to a lower height than the maximum possible liquid level for that container and this particular tube has been filled above the normal fill level.	Redefine the Search Height and make sure it is above the maximum possible liquid level that will be encountered for that Area.
	14	Probe sensitivity has been set too high and the probe is sensing liquid before the Search move starts or before it reaches the Search Height	Adjust probe sensitivity
	15	Probe electrical connections or wiring have been damaged and the probe is producing an intermittent short circuit.	Replace probe
5. Failed to dispense correct amount of sample or reagent No error generated Pippeting code on screen = Green Pippeting code in Activity Log = "OK" Appeared to perform the aspirate step OK	16	Effective Diameter in Area set too large so probe not tracking liquid surface correctly. As probe is not moving fast enough the probe ends up aspirating air	Redefine Area and make sure probe remains under surface of liquid throughout the aspirate step.
	17	Aspirate speed set too high, not giving probe enough time for aspirated liquid to enter tip	Check value for Aspirate speed in the protocol. This value should be 50.
	18	Froth on top of diluted sample causing probe to aspirate air	
6. Bubbles on top of samples	19	Dispense speed too high	Reduce dispense speed and introduce mixing step to achieve homogeneity
	20	Dispense height too high	Lower Dispense Height for the Area

			file
7. Droplets on tip of probe	22	Syringe tip is worn	Change the syringe tip
	23	Syringe connectors not tight or 1 of the teflon washers is missing	Check that the white teflon washer is present in those ports which require one.
	24	Syringe valve is leaking (rare on new instruments)	Replace valve
8. Washbowl flooding	25	Waste tubing has a kink or loop in it or bottle is full	Ensure that the gravity waste tubing can drain freely into a waste bottle. Ensure that the tubing runs "downhill" all the way to the mouth of the bottle.

7.2 Software Error Messages

Area not found
One of the Area files is missing when you try to run the applications software. If it is you will need to copy the Area file from the \kwinsp\defaultareas directory into the \kwinsp directory.
.
Runtime System Error: Failed to evaluate an expression - Bad Syntax in the following formula: 1
This arises when trying to run some Applications with the wrong Regional Number Settings.

Failed to communicate with instrument – Switching to Off Line mode
Instrument is not connected to computer or it is powered off. Incorrect Port setting in configuration.

Z Error
Occurs when probe has been unable to reach the destination programmed. This may be because of an obstruction. Can occur if Search Height is set too low in the Tip rack Area.

7.3 Error Logs

A number of "log files" are created to record specific errors if generated during processing. Make sure that the logging option is selected in the Configuration program. (See 4.6.7)

The log files are :

Beedrive.log
Runtime32.log
SetArea32.log
Runtime.log

If you encounter an error during processing your supplier may ask you for a copy of these files. They are all located in the C:\kwinsp directory. You can locate and group them together using Windows Explorer and by clicking on the Type tab on the top right hand screen and looking for Text files.

The most useful is the Beedrive.log which is overwritten each time the Runtime software is loaded. If you do encounter an error during processing you must make a copy of this file **before** running the instrument again.

All of the log files are text documents and can be opened in Notepad.

8 Creating New Applications

8.1 Overview

The XSP-220 is provided with two programmable applications used for transferring samples and creating worklists. Each of these can be configured to meet your specific requirements by modifying a number of parameters using the Configuration Application. This also allows a number of Hardware and Data options to be configured. Note that this not the same program as the Instrument Configuration program described earlier in section 4.6.

8.2 Configuration Main Menu

From the Runtime Main Menu select the Protocols > XSP-220 Configuration option. You will now have options as shown in Figure 56. The Hardware options allows you to configure certain global parameters that will affect all applications. The Applications option allows you to edit and create new Applications. The Data option allows you to configure parameters associated with the file handling e.g. worklists.

Figure 56

8.3 Hardware

Selecting the Hardware button will display the following options shown in Figure 57

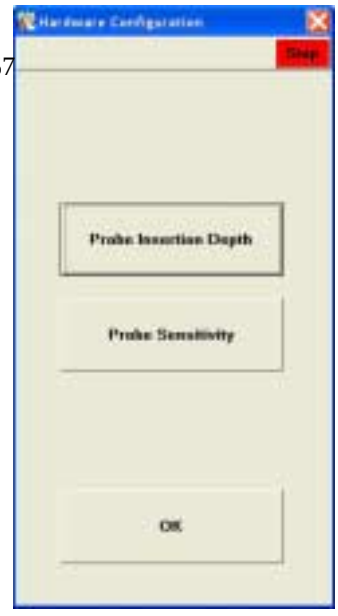


Figure 57

8.3.1 Probe Insertion depth

The Probe Insertion Depth controls how deep the probe will insert under the surface of liquid once it has detected liquid. Setting this value will ensure that the wetting of tip is minimised and will help accuracy, reproducibility.

However, if accuracy and precision performance is not too critical a larger insertion such as 3mm will allow the instrument to process more quickly.

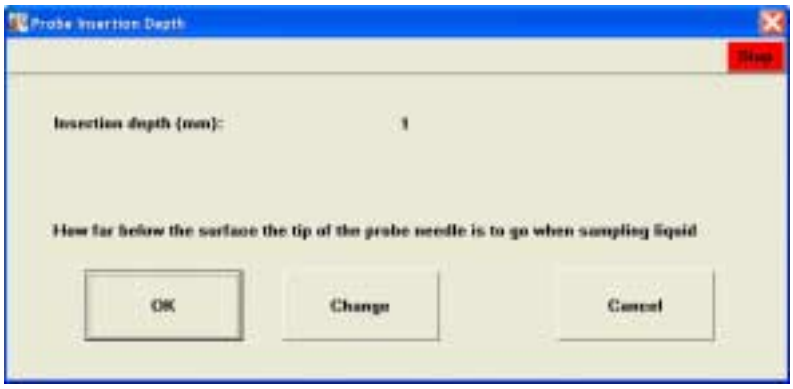


Figure 58

8.3.2 Probe Sensitivity

The sensitivity of the level detector can be tuned by adjusting the speed of the syringe and Z drive during a Search move. A value of 125 works with a 2500ul syringe but can be adjusted here if necessary.

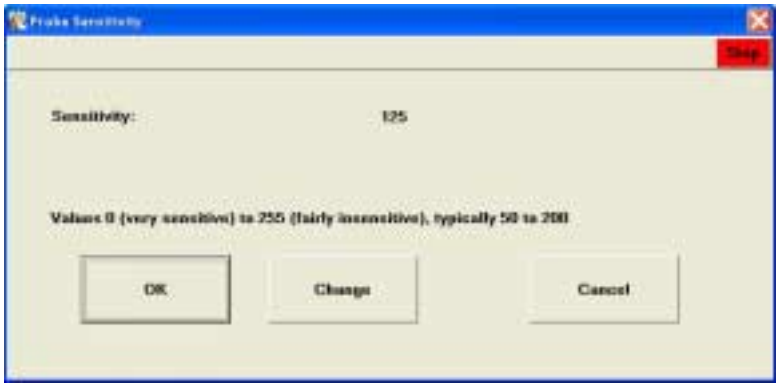


Figure 59

8.4 Applications

Selecting the Applications button shown in Figure 56 will display the window shown below.
This window allows you to modify the parameters for each of the existing applications and also to create new applications.

The Navigate buttons allow you to select any of the Applications already defined in a list.

The Add After button allows you to create a new Application immediately after the current position in the list

The Move Down and Move Up button allows you to move an application so that it appears in a different position in the list. This is useful if you want the most commonly used application to appear at the top of the list displayed during processing (see Figure 48)

Figure 60

8.4.1 Areas

Selecting the Areas button displays a screen allowing you to specify which Area files contain the coordinates of the racks you are using. Currently the Application uses only the Areas specified in the Liquid Handling 1 Source and Target fields. To change the Areas used select the Change button and navigate to the Area file you require.

Figure 61

8.4.2 Application Type

When creating a new application by using the Add After button you will be asked to specify the Application Type.
There are currently 2 Application types namely the Transfer Type and the LoadSamples Type. To select a differentType press the Arrow keys.

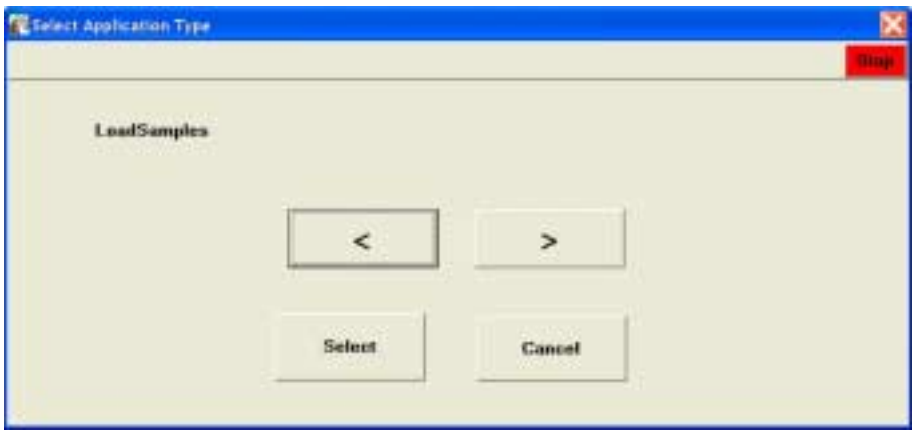


Figure 62

Having selected a Type you will be prompted to give it a name. You will then be able to edit the parameters for your new application.

To save a new application choose Exit followed by Save and Exit.

Note that if you have not changed any parameters from their initial default the application will not be saved.

8.4.3 Transfer Type Parameters

8.4.3.1 Volume specification method

This specifies where the volume to be pipetted is controlled.
Enter 0 to specify within the application – avoids the user having to enter it each time but cannot be changed
Enter 1 to allow user to specify volume when application is run
Enter 2 to read the volume from a worklist. This would allow a different volume to be pipetted for each sample

Enter your choice and select the right arrow button to move onto the next parameter

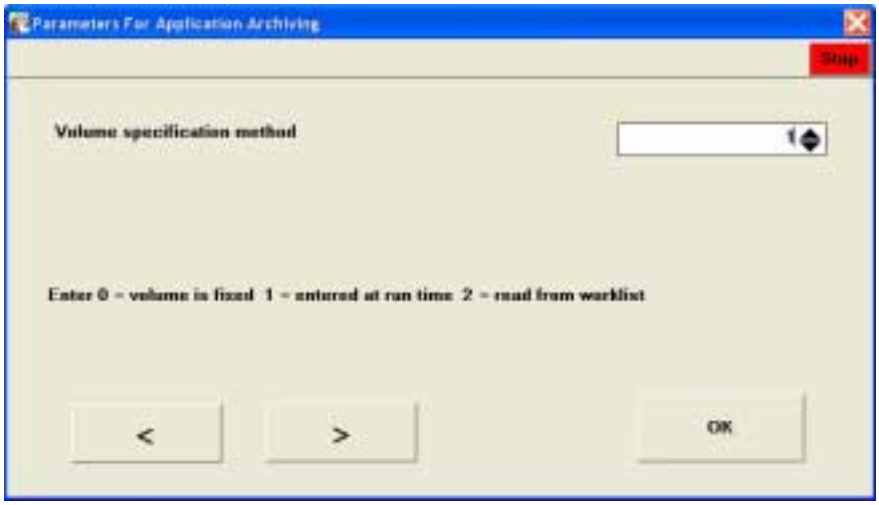

Parameters For Application Archiving
Stop
Volume specification method
1
Enter 0 = volume is fixed 1 = entered at run time 2 = read from worklist
<
>
OK

Figure 63

8.4.3.2 Default volume to be transferred

The application will default to pipetting the volume specified here. If the previous option (8.4.3.1) is set to 1 the initial volume displayed by the prompt requesting the volume at Runtime will be set to this value.

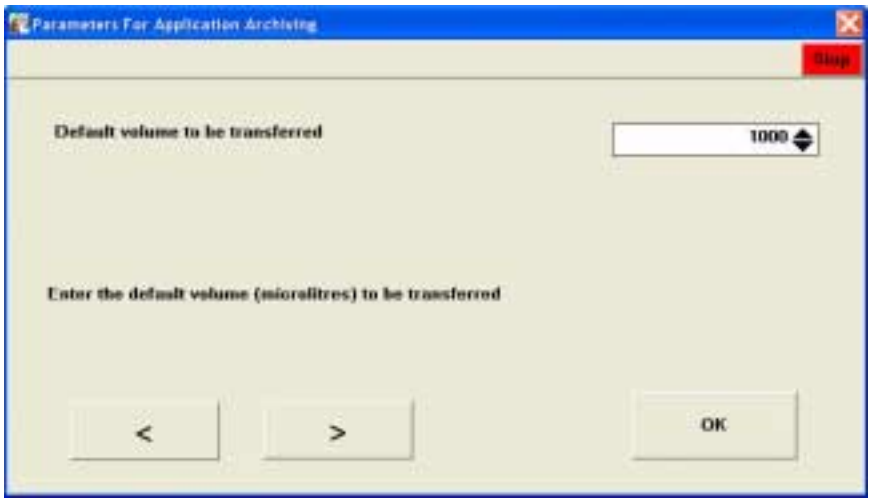


Figure 64

8.4.3.3 Liquid Sensing

This controls how the level detector is used during the Sample Aspiration process.

Enter 0 to disable the level detector. The probe would aspirate from the Search Height.
Enter 1 to use the level detector on each visit to an individual position.
Enter 2 to only use the level detector on the first visit to that tube

Normally this should be set to 1

Parameters For Application Archiving
Stop
LiquidSensing
1
Enter 0 - no sensing 1 - sense every time 2 - sense once in each tube
<
>
OK

Figure 65

8.4.3.4 Action if insufficient volume

This controls what happens if the volume calculated to be in the tube is less than the volume specified by the Default Volume.
Enter 0 to ignore the sample
Enter 1 to pipette as much as possible . In this case the probe will go down to the bottom of the tube (Minimum Liquid Height) and aspirate the Default Volume. If the volume is actually less than that required some air will be introduced into the tip.
Note that the Minimum Liquid Height should always be at least 1mm above the bottom of the tube to prevent it from being completely blocked in this situation.

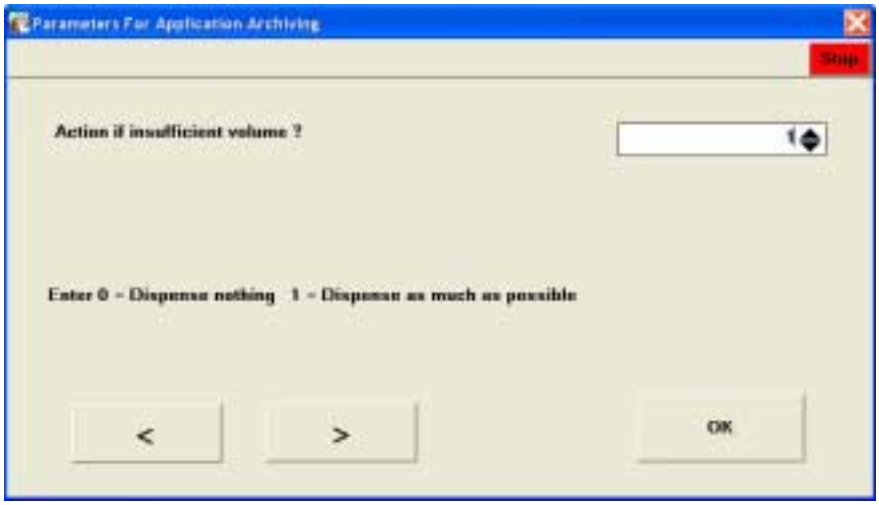

Parameters For Application Archiving
Stop
Action if insufficient volume ?
1
Enter 0 - Dispense nothing 1 - Dispense as much as possible
<
>
OK

Figure 66

8.4.3.5 Disposable tip blow out volume

This field controls the amount of air used to blow the source liquid out of the tip to ensure complete ejection of the volume aspirated.

If using Wet mode 50ul is usually sufficient. If Dry then use a value of 100ul.

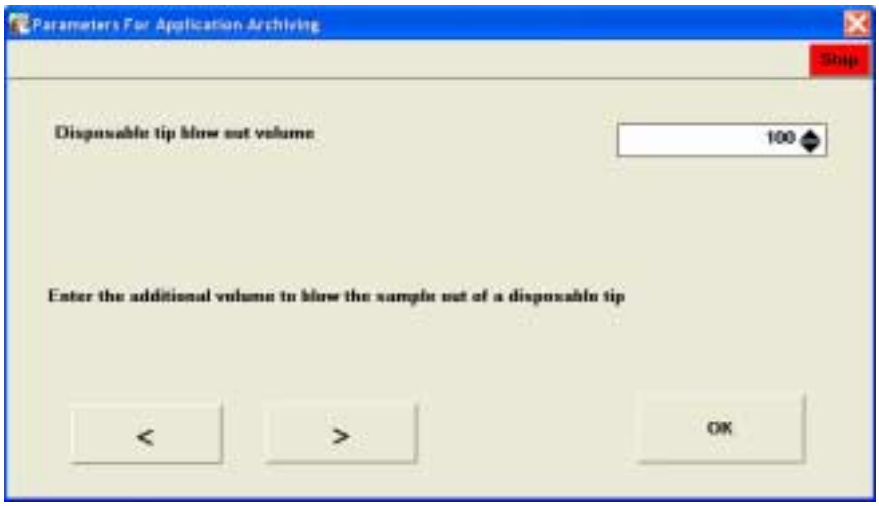

Parameters For Application Archiving
Stop
Disposable tip blow out volume
100
Enter the additional volume to blow the sample out of a disposable tip
<
>
OK

Figure 67

8.4.3.6 Flush volume

The Flush volume resets the liquid column in the probe when using the Wet mode. This prevents any bubbles from breaking up during processing which may cause a change in the performance. The volume specified here is dispensed out of the probe in between each sample and is typically set to around 200ul.

If using Dry mode this should be set to 0 in which case the probe will not visit the Washbowl – except in certain error conditions.

Figure 68

8.4.3.7 Source Position flag

This controls the sequence of processing in the Source tube rack

If set to 0 the tubes will be processed strictly in the position sequence in which they occur in the rack eg, 1,2,3,4,5,etc

If set to 1 the sequence is controlled by means of a layout file. A layout file is a simple text file that specifies which positions will be processed and is useful if a certain number of positions are always omitted eg the first row of a rack or perhaps the first postion in every row.

If set to 2 the sequence of positions will be read from a specific field within the Worklist. This allows the sequence to be different for every batch if required.

Layout File Option not yet implemented

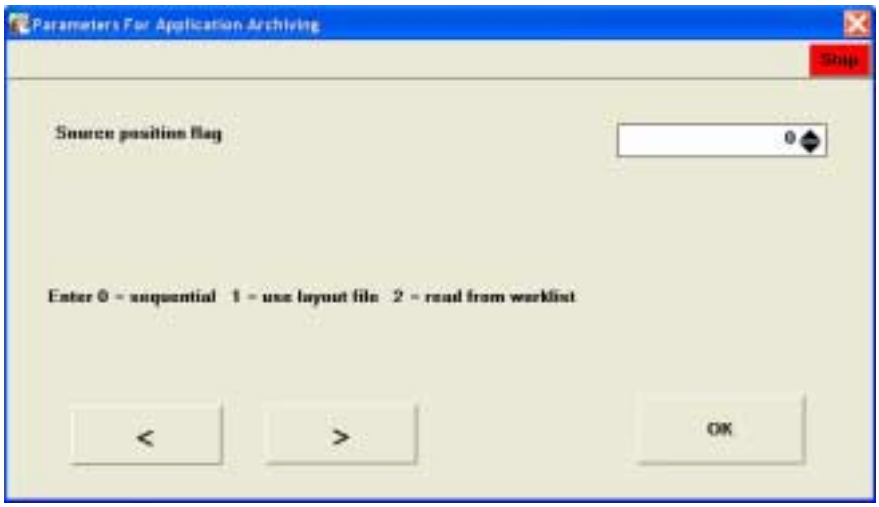
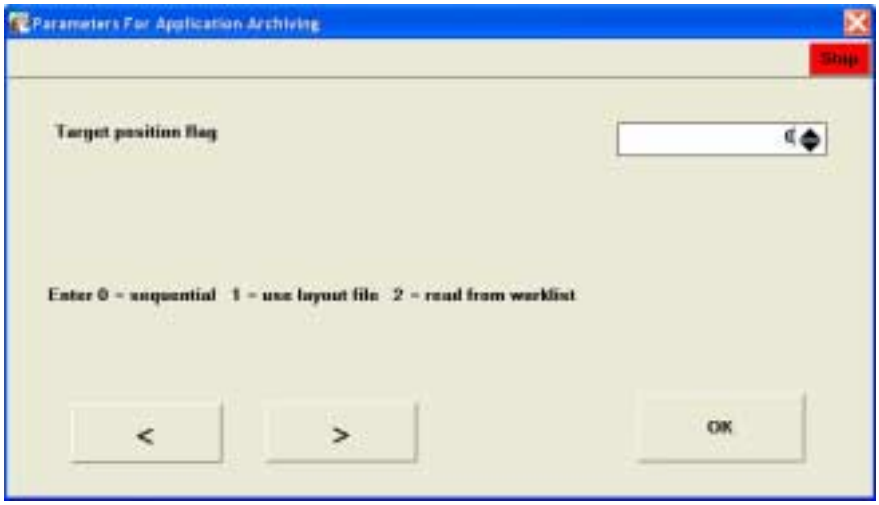

Parameters For Application Archiving
Stop
Source position flag
0
Enter 0 = sequential 1 = use layout file 2 = read from worklist
<
>
OK

Figure 69

8.4.3.8 Target Position Flag

This is analogous to the Source Position flag and controls the sequence of positions in the Target rack
For archiving this would usually be set to 0 i.e. samples loaded into sequential positions.


Parameters For Application Archiving
Stop
Target position flag
0
Enter 0 = sequential 1 = use layout file 2 = read from worklist
<
>
OK

8.4.3.9 Full path of layout file

If a layout file is specified for either the Source or Target positions you should enter the name of the file here

e.g. C:\XSP\layouts\layout1.txt

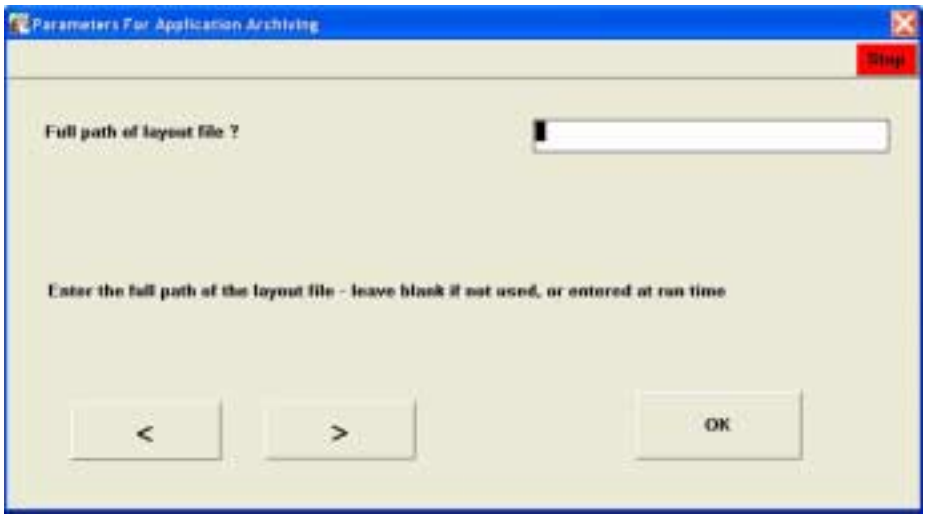

Parameters For Application Archiving
Stop
Full path of layout file ?
Enter the full path of the layout file - leave blank if not used, or entered at run time
<
>
OK

Figure 70

8.4.3.10 Leave space if cannot process

This controls what happens to the loading of the Target rack in the event it encounters a tube which it cannot pipette e.g. if there was no liquid detected in the tube. The value you chose will depend on whether you always want to maintain the same sequence in both Source and Target. Another reason is that you might always want the option of trying to manually pipette some sample into the archive plate.

Set to 0 if you do not want an empty position
Set to 1 to leave a space in the target rack (normal)

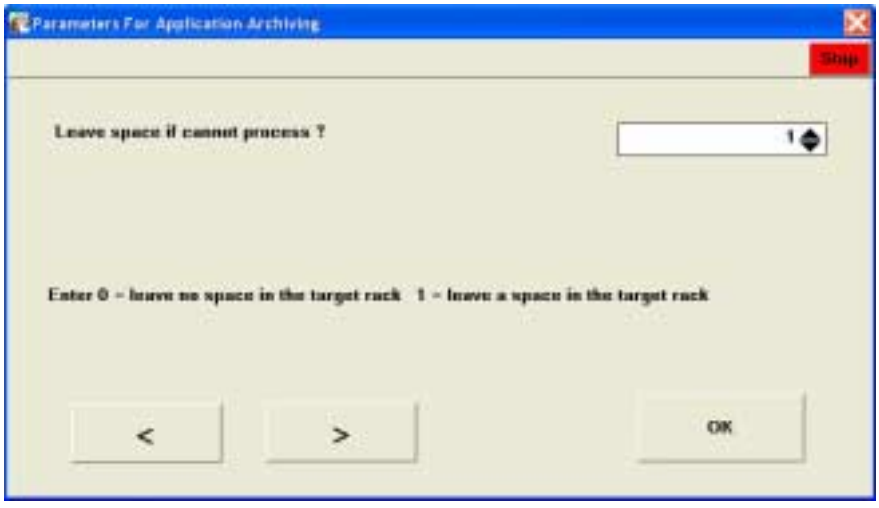

Parameters For Application Archiving
Stop
Leave space if cannot process ?
1
Enter 0 - leave no space in the target rack 1 - leave a space in the target rack
<
>
OK

Figure 71

8.4.3.11 Source and Target Areas overlap

Leave this set to No.

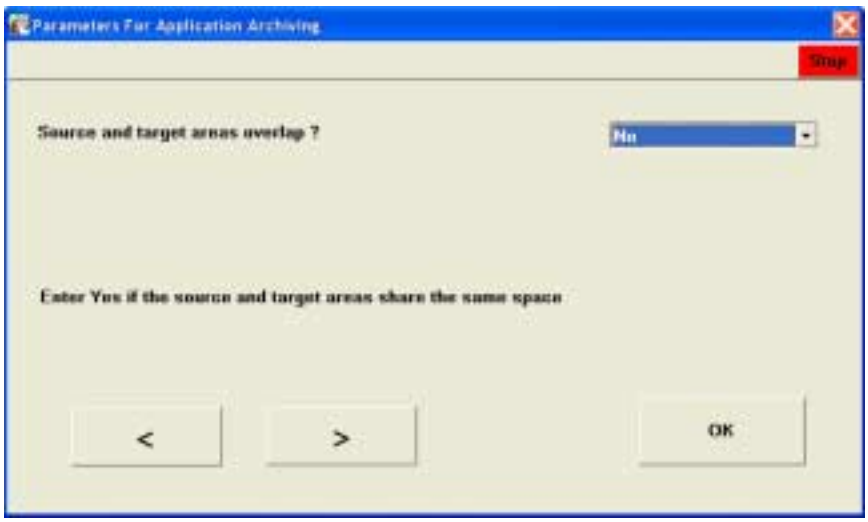

Parameters For Application Archiving
Stop
Source and target areas overlap ?
No
Enter Yes if the source and target areas share the same space
<
>
OK

Figure 72

8.4.3.12 Barcoded source tube search flag

This option apples if an automatic barcode reader is installed on the instrument.
It allows you to instruct the instrument whether or not to search for a tube within a rack if it is not in its expected location.
You should set this 0 for the XSP-220.

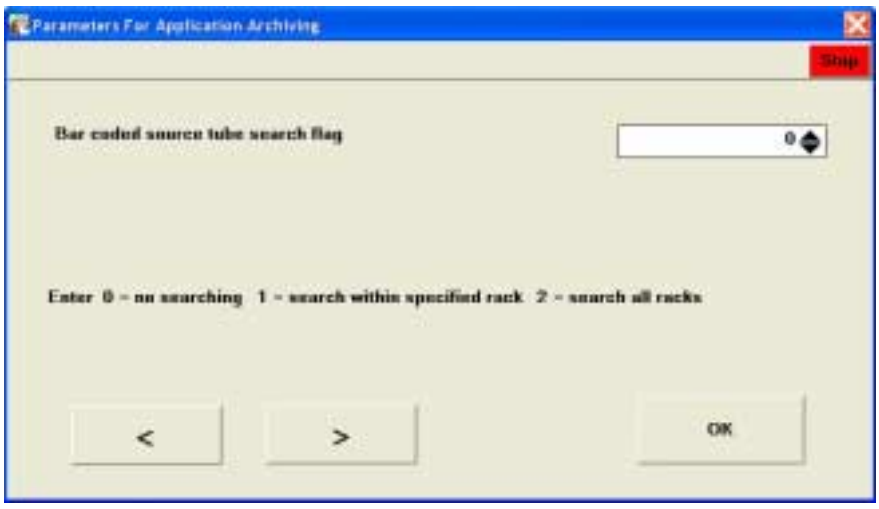

Parameters For Application Archiving
Stop
Bar coded source tube search flag
0
Enter 0 = no searching 1 = search within specified rack 2 = search all racks
<
>
OK

Figure 73

8.4.3.13 Worklist flag

This controls the use of a worklist

Enter 0 if no worklist is to be created
Enter 1 to create a worklist during execution
Enter 2 to use an existing worklist. If you use the same worklist more than once it will simply overwrite any existing data.

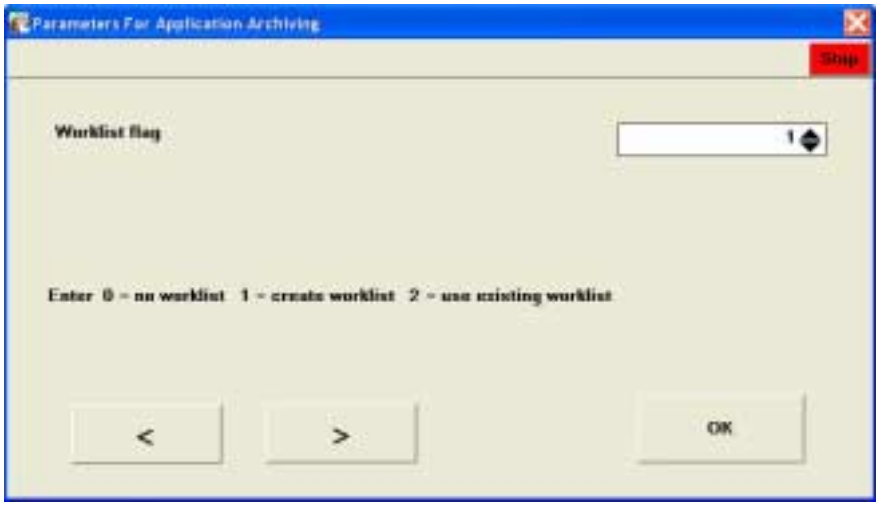


Figure 74

8.4.3.14 Method of creating sample ID

This controls how the sample identifiers will be created.

If set to 0 it will create a series of sequential numbers. You will be prompted to enter a starting number called a “seed” and the rest of the series will be created by adding 1 to it

If set to 1 you will be prompted to enter a barcode which can be achieved by means of a Wedge reader or keyboard entry.

You will not be prompted to enter codes if using an existing Worklist

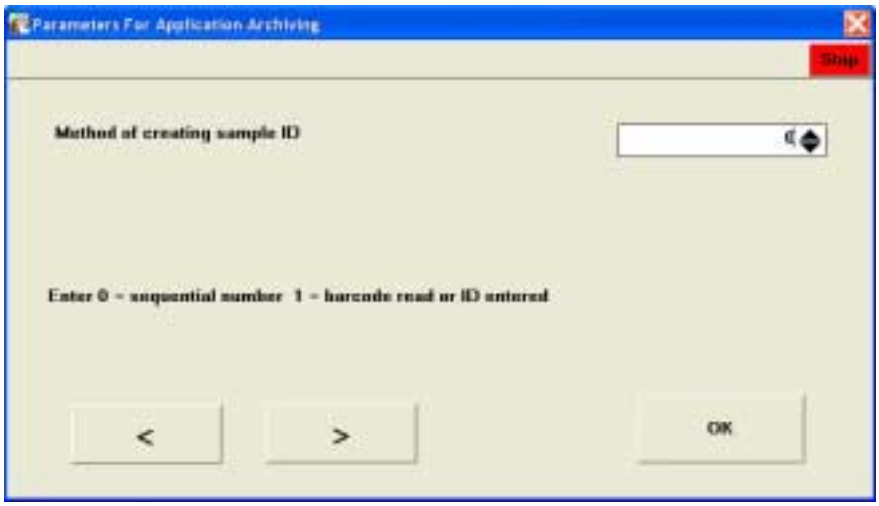

Parameters For Application Archiving
Stop
Method of creating sample ID
0
Enter 0 = sequential number 1 = barcode read or ID entered
<
>
OK

Figure 75

8.4.3.15 Record actual volume transferred

This controls whether the volume transferred is recorded in the Worklist or not.

Enter 0 not to record the volume

Enter 1 to record the volume that was actually pipetted. If the volume is less than the volume that was specified it will record the volume that it has calculated was in the tube as this is also what it will attempt to transfer.

Note that as most tubes (especially plastic ones) are tapered and the calculation assumes a straight walled cylinder ( ) this will only be approximate.

Parameters For Application Archiving
Stop
Record actual volume transferred ?
1
Enter 0 = do nothing 1 = record the actual volume dispensed in the worklist
<
>
OK

Figure 76

8.4.4 LoadSamples Type Parameters

The Load Samples type application is used only for the creation of a Worklist containing sample identifiers.
Curently there is only a single parameter to enter for this application.

The identifiers can be created either based on a sequential series or using a barcode reader as described already for the Transfer application (8.4.3.14).

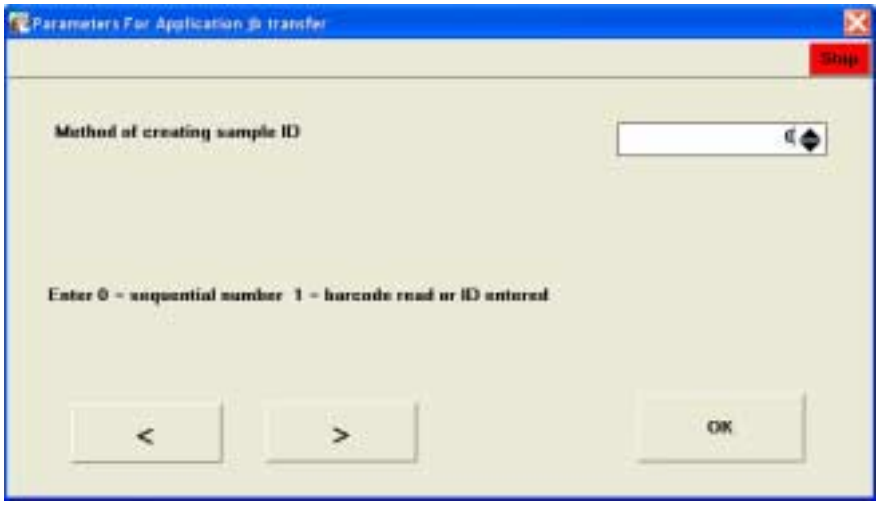

Parameters For Application jb transfer
Stop
Method of creating sample ID
0
Enter 0 = sequential number 1 = barcode read or ID entered
<
>
OK

Figure 77

To Save choose Save followed by Save and Exit. There may be a long pause whilst it writes the files.

8.5 Data Configuration

The Data Configuration Menu is used to set up the parameters associated with the Worklist files

Figure 78

8.5.1 File Type

Selecting the File Type button will reveal the following window. The application software works with either Microsoft Excel or Comma-Separated Variable (CSV) formats. If you wish to change the current setting, click Change. The Change File Type window will appear:

You may currently specify either Comma separated Variable or XLS as the file type to use.

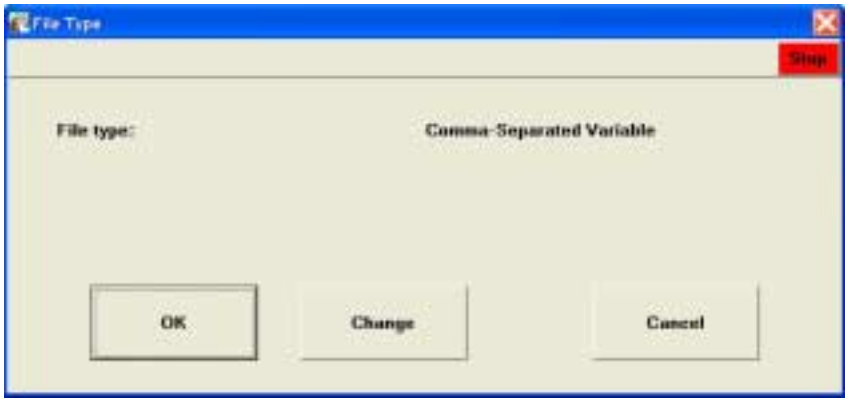


Figure 79

Figure 80

Click the button corresponding to the file format you wish to use. Please note that if the Excel format is selected, this will only work with files in Excel 95 format, and without macros

8.5.2 File Locations

8.5.2.1 Worklists

When an instrument application is run, a worklist is selected from a “pending” folder. During processing, the worklist is transferred to a “processing” folder, and, on completion, the worklist is transferred from there to a “processed” folder. These 3 folder may be different, two of them may be the same, or all 3 may be the same.
To specify these folders, click File Locations on the Data Configuration menu.
The File Folders window will appear:

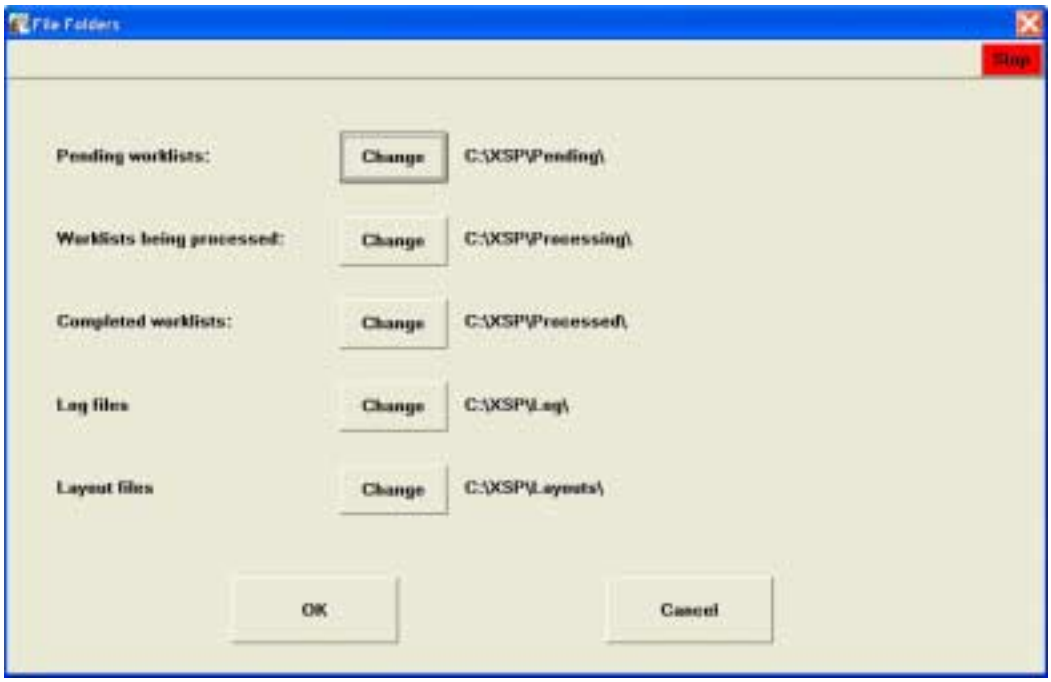


Figure 81

To change any one of the folders, click the appropriate Change button A Select Folder dialog will appear:

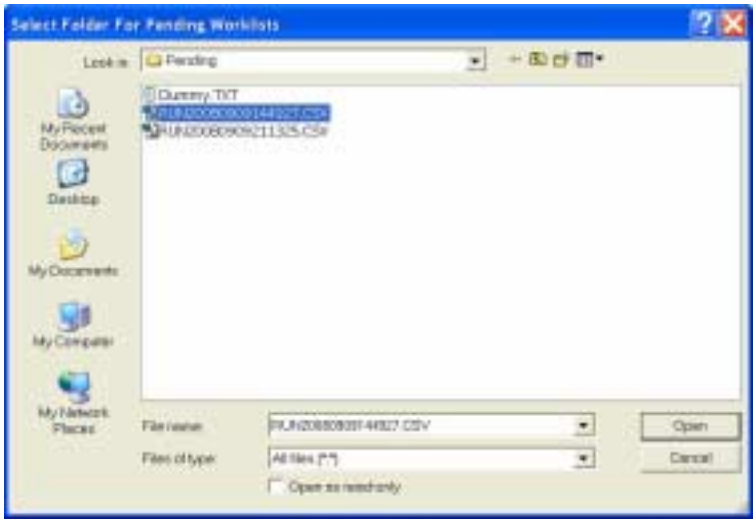


Figure 82

Navigate to the folder required and select a file (any file will do) in that folder and then click Open. You will return to the Folders window with the changed folder denoted.

Note that for this to work, there needs to be a file (even a totally blank one) in the folder, for you to select.

8.5.2.2 Log Files and Layout Files

Here you may also specify the path for the log files and the layout files

8.5.3 Worklist Format

Click Worklist Format on the Data Configuration Menu. The Worklist Format dialog will appear:

This dialog allows you to specify the format used by the worklists (be they Excel or CSV files). The left-hand column gives the name of the fields as used internally by the XSP-220 software and cannot be changed. The names actually used in the Worklists can be specified in the Field Name column. The Column No controls the order of the fields in the worklist and in the example below the Source ID column is the first and Source position is the second. A total of 7 fields has been specified.

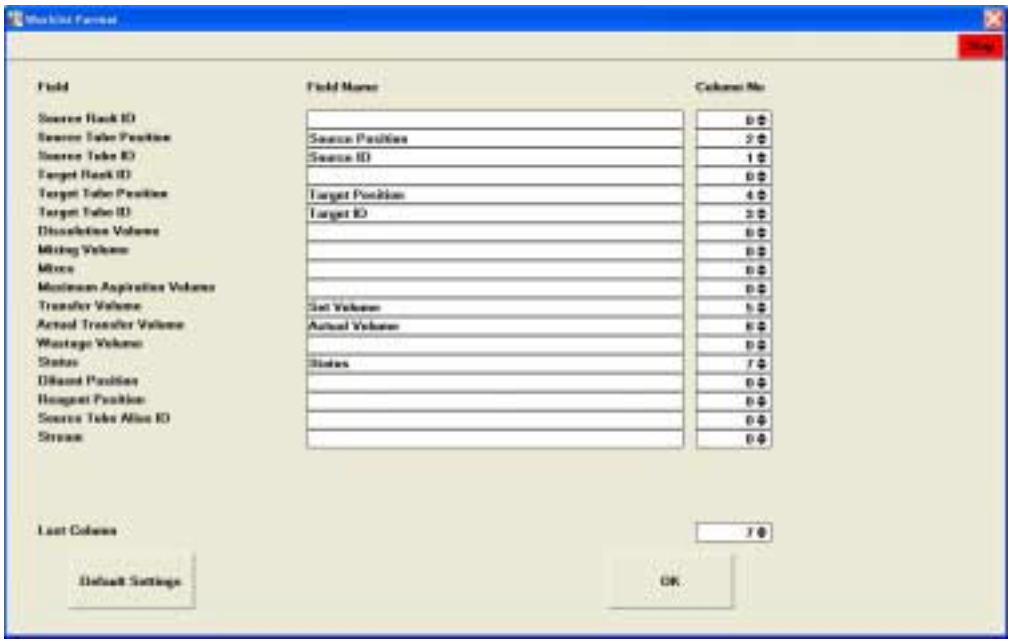


Figure 83

These fields have the following fixed meanings:

Field	Meaning
Source Rack ID	The identifier of a source rack, usually a linear barcode read by the instrument
Source Tube Position	The position within a given source rack whose tube is to be processed
Source Tube ID	The identifier of the source tube (typically either a 2D bar code or a linear bar code)
Target Rack ID	The identifier of a target rack, usually a linear barcode read by the instrument
Target Tube Position	The position within a given target rack whose tube is to be processed
Target Tube ID	The identifier of the target tube (typically either a 2D bar code or a linear bar code)
Dissolution Volume	The volume of diluent (microlitres) to be dispensed
Mixing Volume	The volume of liquid to be aspirated from and dispensed back into a tube during each individual mix step
Mixes	The number of mix steps to be performed on each tube
Maximum Aspiration Volume	The maximum volume to be aspirated from a source tube when transferring liquid to a target tube
Transfer Volume	The volume of liquid to be transferred to the specified target tube
Actual Transfer Volume	The volume of liquid actually transferred to the target
Wastage volume	
Status	A text string indicating the status of the operation specified on the current row of the worklist, typically “PENDING”, “OK” or “ERROR”
Diluent Position	The position within the rack specified by the application from where to aspirate diluent
Reagent Position	The position within the rack specified by the application from where to aspirate reagent
Source Tube alias ID	
Stream	

8.5.4 Well Number Format

Click Well Number Format on the Worklist Configuration Menu. The Well Number Format window will appear:

Figure 84

8.5.4.1 Source Area Well Number Format

The XSP-220 can handle 3 different formats of microtube rack position or microplate well number:

Numeric – where the positions are numbered from 1 upwards
Alphanumeric – where the positions are “numbered” from A1 to H12

Numeric positions match the way the instrument Areas are defined. For example, a 96 position microplate may have its wells numbered in 12x8 or 8x12 orientations; the direction of the numbering may be done in various ways as well.

Alphanumeric numbering is assumed to be done in the same way as the conventional numbering of a microplate, with position 1 being “A1”, 12 being “A12” and 96 being “H12”. In fact, the XSP-220 software is capable of distinguishing between numeric and alphanumeric well number formats in any worklist that is read into the system, so it is only when generating worklists from scratch, or appending data to an existing worklist, that the software needs to know what format to use.

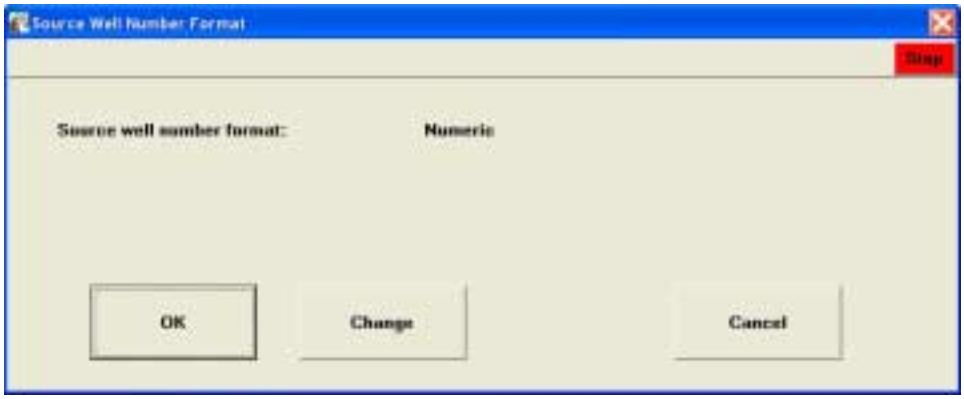


Figure 85

If you wish to change the well number format from numeric to alphanumeric, or vice-versa, click “Change”. The Change Source Well Number Format dialog will appear:

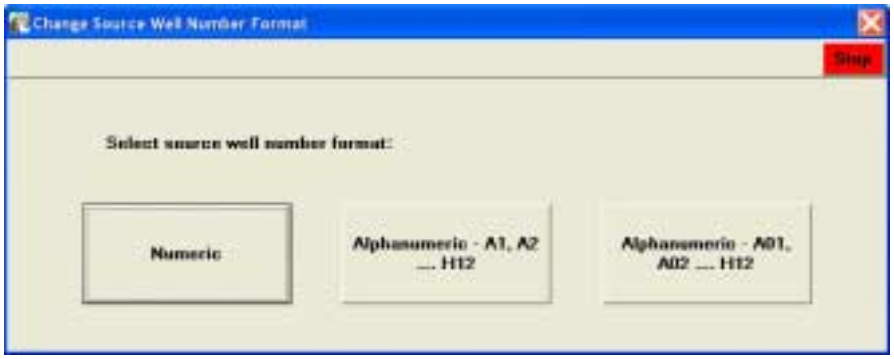

Change Source Well Number Format
Stop
Select source well number format:
Numeric
Alphanumeric - A1, A2 ... H12
Alphanumeric - A01, A02 ... H12

Figure 86

:
Click the button corresponding to the format you require. You will return to the Source Well Number Format window:

8.5.4.2 Target Area Well Number Format

This can be specified in exactly the same way as for the Source well number format.

8.6 Saving Changes

Finally when all changes have been made choose the Save and Exit button.

9 Maintenance and repairs

9.1 Overview

In order to maintain the performance of the sample processor at its optimum level, certain operations are necessary on a daily basis and others weekly or every fifty to one hundred hours of operation. Refer to Appendix B for recommended maintenance schedule. It is assumed that spillage will be dealt with immediately and so maintenance of this kind is not scheduled.
The instructions in this chapter must be followed carefully to avoid problems with short-term reliability, the accuracy and precision of liquid handling and electrical safety.

9.2 Daily Routine

These procedures do not need to be followed if the system liquid is de-ionised or distilled water. If it is, then ignore the daily tasks concerning the liquid path.

Ensure the Tip Adaptor is wiped clean. You may use isopropyl alcohol. (IPA)

Maintenance

9.2.1 Probe and fluid path tubing

If evidence of a leak is apparent and the valve connectors are acceptably finger tight, it is possible that the flanges on the *probe* tube, or system liquid tube might be damaged. When these have been emptied of liquid the connectors can be removed from the valve and the flanges examined. If anything but a flat round concentric flange is observed this may be the cause of the leak. If this is the reason the tubing or probe needs to be replaced.

9.2.2 Valve assembly

A very slight leak will not affect performance unduly, but if drips form on the probe when primed in the home position, then the valve will have to be replaced as soon as possible. Before you reject the valve assembly ensure that the tube connectors are all finger tight.

9.2.3 Syringe drive unit

Inspect the liquid path for any signs of leakage. Check the junction between the valve / barrel, under the piston seal and at the base of the barrel. A serious leak in any of these positions will probably require replacement of the syringe unit.

If using Mode 2 (no liquid in probe) you should ensure that there is always a small amount of liquid in the syringe barrel to lubricate the piston. You may use either water or a few drops of silicone oil. Introduce this into the syringe by first removing it (see 9.4.1) from the instrument, withdraw the piston and with the barrel upside down add a few drops of liquid into the barrel. Replace the piston and remove the air from the syringe before installing it back into the syringe drive.

9.2.4 Lubrication

The Z Rack should be inspected every week to see there is any excessive accumulation of debris and residual lubricant.

If it is wipe the smooth surfaces with a cloth soaked in a mild detergent then, using a small brush, clean the gaps between all the gear teeth to remove as much dirt and debris as possible. After cleaning the Z Rack re-lubricate it by moistening the assembly with a thin coating (four drops) light machine oil e.g. WD40 or similar. Avoid any excess as this will be taken up by the drive pinion and thrown outwards, fouling the sensors. If this happens, errors may occur with the *Z-motion*.

9.2.5 Electrical safety

Periodically inspect the mains lead for damage to the insulation or connections at both ends. If any damage is found, insulate the damaged area and order a replacement lead as soon as possible.

9.3 Cleaning the Instrument

9.3.1 Cleansing agents

Do not use abrasive cleaning agents, as these will damage painted surfaces. A cloth soaked in a mild detergent solution (refer to Appendix A for recommended solutions) is the best means of cleaning the painted and stainless steel parts of the instrument. All surfaces should be routinely cleaned with decontaminating agents.

9.3.2 Sterilisation

Sterilisation of the liquid handling components should be performed regularly, particularly if bio-hazardous materials are being processed. Please refer to Appendix A for recommended solutions that can be safely passed throughout the liquid path. After sufficient contact time, the probe(s) should be primed with at least 20ml of de-ionised / distilled water.

Before performing any maintenance functions on the instrument, ensure that it is completely free of any process-related hazards. Certification to this effect will be required by anyone handling any parts of the instrument after they have been used. This applies particularly when servicing is due or when parts are being returned for any reason.

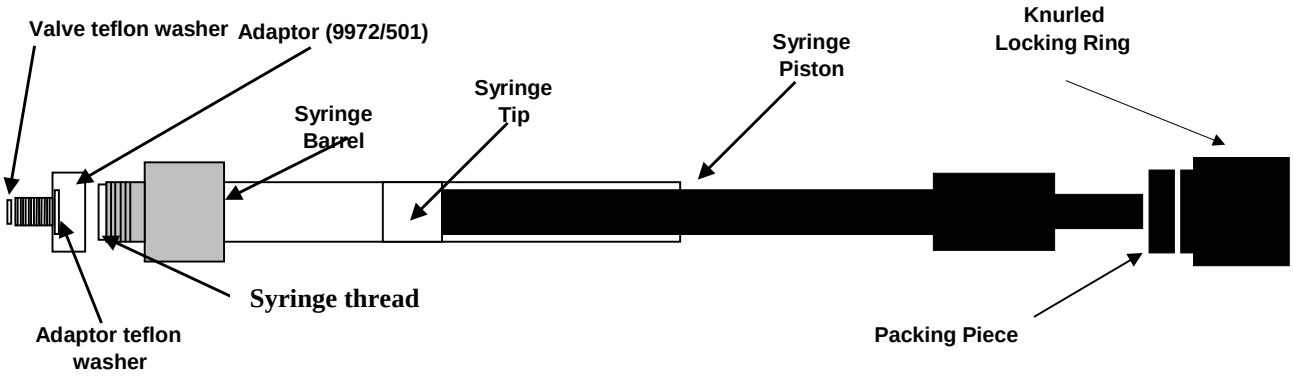
9.4 Replacing parts

9.4.1 Syringe

To replace a syringe you should first ensure that the syringe piston is positioned at the bottom of its stroke. This can be done using the following method:

If using Wet mode – (if using Dry mode proceed straight to step 1 below)
Remove the System fluid tubing from the diluent bottle
Select the prime option from the RunTime main menu.
Press the Function key 10 when the syringe piston is travelling down.
The piston should stop at the bottom of the stroke.
Next switch off the instrument.

1. Undo the knurled locking ring underneath the syringe drive plate by turning it clockwise (viewed from above) and then move the piston up into the syringe.
2. Holding the syringe barrel at the top with one hand and the plastic adapter, the syringe is screwed into with the other unscrew clockwise (viewed from above)
3. If the plastic adapter comes away from the valve with the syringe, then unscrew it from the old syringe.
4. Ensuring that the white adapter teflon washer is still in place inside the adapter, screw it back into the valve block. Also be aware of a small valve teflon washer which is fitted inside the valve. This sometimes falls out and will cause leakage around the top of the adapter. (see fig below)
5. Taking the new syringe ensure the piston is pushed into syringe barrel
6. Screw the syringe into the plastic adapter in the valve block
7. Pull the piston rod down and pass the threaded end through the syringe drive plate
8. Screw the knurled locking ring back onto the piston rod



Syringe Unit

9.4.2 Probe

First remove the existing probe. This is the reverse of the installation procedure as described in Section 3.6.1
Next install the probe as per the installation procedure. You should then check that the co-ordinates of the new probe correspond to the ones currently defined for your system. You can do this using the SETAREA program. Select one of the more critical Areas such as a Microplate or a Slide Area that has small wells and send the probe to the Clearance Height of the first well.

If the position of the new probe appears to be offset slightly you can do one of the following:

- Redefine the co-ordinates of every Area on your system. This is not quite as bad as it sounds as you can probably just apply a “nudge” factor in either the X or Y co-ordinates to each of the Areas.
- Physically move the rack locators (to the left or right as appropriate) for all the affected racks along the locating rails until the rack is in the correct position. This only works if the probe is out of alignment in the “X” as “Y” adjustment is not possible using this method.
- Bend the probe into the correct position. This is the fastest method but take care not to over bend the probes. Note that probes are considered to be a “consumable” not covered by the standard warranty.

The length of the new probe should be within 0.5mm of the old one so for most Areas the Z co-ordinates should not need to be adjusted. However, for critical Areas such as the disposable tip racks and microplates if the height of the new probe needs modifying it is best to do this by adjusting the Z co-ordinates for each of the affected files. This can usually be done by modifying the critical heights by 5 or 10 steps up or down as appropriate.

9.5 Unblocking the DT Probe Sensor Tube

To operate correctly it is important that the DT Tip adaptor and the DT Sensor tube remain dry. The sensor tube is a very fine tube and can get wet if the probe is accidentally immersed in liquid. Once this has happened you may get intermittent liquid handling errors in particular failure to detect liquid.

In order to correct this you need to

1. Remove the tip adaptor and dry it completely, especially the interior bore.

2. Blow air through the Sensor Tube to remove any liquid that may have become trapped in its internal surfaces. This is done by disconnecting the probe pressure sensor connector from the instrument and connecting it up to the 20ml disposable syringe (included in the installation kit) using the coupling provided (see Figure 87) . Fill the syringe with air before connecting it and once connected blow the air through the probe. Disconnect and repeat 3 to 5 times to ensure that any liquid has been expelled.

3. Reconnect the probe connector to the Pressure Sensor Port and refit the Tip Adaptor.

Figure 87

10 Spare Parts List

The following is a list of some of the essential spares and consumables that may be required. Please note that none of these items listed as Demo Consumables are covered as part of the Warranty. It is recommended that you have these items available in your laboratory at all times.

Demo Consumables	
Disposable tips 1200ul volume in wafer (pack = 768 tips)	**TIP 1005**
Dilution tubes in strips of 8 (pack of 1000)	**2685/013**
Syringe* 1.0ml	**7350/107**
Syringe* 2.5ml	**7350/108**
Diluent Tubing and Sleeve (for System Fluid Bottle)	**9972/208**
Beeline 220s Installation Kit	**KIT1022**
Autoclavable bags for waste tips (Pack of 100)	**MME9361**
DT Probe	**9967/201**
Tip adaptor compatible with TIP1005	**3432DA**
Autoclavable waste tip bags	**MME9361**
Racks	
Disposable tip rack for 1200ul wafer tips (non-sterile)	**7030/092**
96 posn. x13mm Diameter Sample + 1 x SBS Format location	**7030/093**
Rack locator (Lockable)	**9967/410**
Rack Locator (Standard) with SS grub screw	**9972/218**
Z Drive	
Z Rack (4.0mm ID) with end stop insert	**9972/260**
Probe Z guide ?	**9972/502**
Syringe Drive	
Solenoid Valve Assy (3 Port) c/w cable & washer (LIQX)	**9963/234**
Solenoid Valve Syringe Adaptor + PTFE washers	**9972/501**
Miscellaneous	
Fuses 2 Amp `T` type (Pack of 10)	**2070/002**
Unblocking kit (Included in KIT1022)	**9963/500**
Disposable Syringe 20ml (Unblocking kit)	**FLU9746**
Coupler (Unblocking kit)	**HOC9709**
Silicone Grease 100gram tube	**2800/025**
Installation kit	**KIT1022**
Wedge barcode reader (Cipher)	**BCR1005**
Wire for unblocking probes 2mtr	**7650/006**
Probe Support rod	**6320/040**
System Fluid Bottle assembly including tubing	**9972/205**
DT Probe Compression Spring	**MME 9357**
DT Knurled locking collar	**3427**

* Choice depends on which sizes have been installed

11 Technical Specification

11.1 Instrument dimensions

Width: 475mm
Depth: 565mm
Height: 350mm excluding probe.

700mm vertical clearance required to allow for free probe movement
100mm clearance at rear required for cables

Working Area of Probe (without cover)	330mm (X) x 275mm(Y) x 105mm (Z)
Working Area of Probe (with security cover)	328mm (X) x 275mm(Y) x 105mm (Z)

Resolution of stepper motors: X = 8 steps / mm, Y = 8 steps / mm, Z = 22.5 steps
Syringe Drive 5000steps / 60mm

Weight: 19.5Kg (approx.)

11.2 Power requirements

Supply voltage: 90 V AC to 265 V AC
Power consumption: Maximum = 200VA

11.3 Chemical Compatibility

Fluid path

Syringe –	Glass barrel and PTFE seal
Syringe valve	Fluoroelastomer seal
Probe Needles	PTFE coated stainless steel
Probe tubing	FEP & PTFE
System fluid tubing	HDPE
Tip Adaptor	PCTFE

All valves, Syringes & tubing are manufactured from glass, Kel-F, PTFE, LDPE & FEP based materials for chemical resistance (except to HF & HF compounds).

12 Regulatory Issues

12.1 Declaration

This instrument complies with the appropriate Council Directives pertaining to EMC, Electrical & Mechanical Safety, a copy of our 'DECLARATION of CONFORMITY' detailing which directives are covered can be ordered separately. The Xsp-220 has been CE marked

WARNING!

If the cover is removed for any reason Electrical/Mechanical Hazards can be exposed, it is therefore **IMPORTANT** that the power cable is **REMOVED** prior to gaining access to any internal components.

12.2 Environment

The XSP 220 is suitable for use with an ambient temperature range of 18 °C to 31°C with a maximum relative humidity of 80% for temperatures up to 31°C

12.3 WEEE Directive (Directive 2002/96/EC) *

The Waste of Electrical and Electronic Equipment directive has been introduced to minimise the quantity of electronic equipment entering the landfill waste stream and to ensure the proper disposal of such equipment. HTZ complies with this directive and will accept the return of any equipment sold by us after August 2005. All other instruments can be returned only with the agreement of HTZ Ltd.
To return product, please contact HTZ Ltd for a RCN number. Return shipments are the responsibility of the customer. Where necessary instruments returned MUST have a decontamination certificate; HTZ retain the right to refuse returns where this is in doubt.

- This only applies to England, Scotland, Wales and Northern Ireland.

12.4 RoHS Directive (2002/95/EC)

The Restriction of Hazardous Substances directive is aimed at restricting or eliminating the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, or polybrominated diphenyl ethers in electrical and electronic equipment. HTZ Ltd, together with our suppliers will make every effort to remove these substances from our products but currently our products fall under the category of Monitoring and Control Instruments and as such are not included in the directive.

13 Warranty

1. HTZ Ltd. Warrants to the Purchaser for a period of twelve months if supplied direct to a Customer or fifteen months, from initial shipment if supplied to a third party) that the Company's instrument is free from defects in workmanship or material under normal use and service. This warranty commences on the date of delivery to the Purchaser
2. During the warranty period the Company agrees to repair or replace, at its sole discretion, without charge to the Purchaser any defective component. The Purchaser must inform the Supplier of the instrument of any defects to arrange repair either by return or on-site.
3. Repaired Instruments shall carry the same amount of outstanding warranty as from original purchase, or ninety days which ever is the greater.
4. This warranty is contingent upon the Customer following the "Daily Routine" 9.2 and "Regular Maintenance" 0 procedures.
5. All parts listed as essential Spares and Consummables (10) are excluded from the warranty.

14 Useful Contacts

The recommended Bio-hazard decontaminating agent is MedDis and is available from:
Hay Man Medichem,

11 Westerham Road,
Bessels Green,
Sevenoaks,
Kent.
TN13 2PX
United Kingdom

Tel: +44 (0) 1732 763555
Fax: +44 (0) 1732 763530

The volumes available are:

- 250ml Concentrate
- 2 Litre Concentrate
- 5 Litre Ready to use

For your local distributor please refer to www.medichem.co.uk

Appendix A

Maintenance Schedule

Wk No: ……

Start of day - Daily Details	**Mon**		**Tues**		**Wed**		**Thurs**		**Fri**		**Sat**	
Empty Vacuum Waste bottle												
Empty Washbowl waste container												
Re-fill System fluid												
Run Start of Day Protocol												
Clean Probe Nozzles with Methanol												
Sensitivity Check (Utilities protocol)												
Ensure all racks are secured on the bed												
Check Washbowl operation												
End of day - Daily Details												
Run End of Day Protocol												
Clean Probe Nozzles with Methanol												
Weekly Details												
Clean Z rack (if necessary)												
Run End of Day Protocol												
Run Decontaminate with Medis & Dist. H_2O												

Notes: Tick the relevant left hand box and signature the right hand box.

Wk No: ……

Start of day - Daily Details	**Mon**		**Tues**		**Wed**		**Thurs**		**Fri**		**Sat**	
Empty Vacuum Waste bottle												
Empty Washbowl waste container												
Re-fill System fluid												
Run Start of Day Protocol												
Clean Probe Nozzles with Methanol												
Sensitivity Check (Utilities protocol)												
Ensure all racks are secured on the bed												
Check Washbowl operation												
End of day - Daily Details												
Run End of Day Protocol												
Clean Probe Nozzles with Methanol												
Weekly Details												
Clean Z rack (if necessary)												
Run End of Day Protocol												
Run Decontaminate with Medis & Dist. H_2O												